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An analysis of the effect of the global war on terror on the retention of United States Military Academy graduates

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NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

AN ANALYSIS OF THE EFFECT OF THE GLOBAL WAR ON TERROR ON THE RETENTION OF UNITED STATES MILITARY ACADEMY GRADUATES

by

Serdar Genc

March 2008

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13. ABSTRACT (maximum 200 words)

This thesis analyzes whether the frequency and length of military deployments, due to the Global War on Terrorism, had an effect on separation at the end of the initial service obligation for USMA (United States Military Academy) graduates between 1994 and 2001. Two types of cohorts, those who were eligible to make the stay/leave decision before March 2003 and those who were after March 2003, are compared by using difference-in-difference estimation techniques.

The General Deployment Model indicated that deployment had an adverse effect on retention. The results indicated that retention was 14.5% points lower for the period after Gulf War II (post-GWOT period). It was also found that as Army officers experience more deployments, their probability of leaving increases as well. An officer who deployed once is 7.3% points more likely to leave while one with two or more deployments is 10.7% points more likely to leave the Army, compared to an officer with no deployment.

Models which compare hostile and non-hostile deployments indicate that both types of deployment affect negatively the decision to leave. However, non-hostile deployments had greater effects on the decision to leave than hostile deployments. In the post-GWOT period the effects of non-hostile deployments were even greater compared to officers in pre-GWOT period. Specifically, an officer with more than 15 months experience in a non-hostile area is 23 percentage points more likely to leave relative to his peer in the pre-GWOT period.

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AN ANALYSIS OF THE EFFECT OF THE GLOBAL WAR ON TERROR ON THE RETENTION OF UNITED STATES MILITARY ACADEMY GRADUATES

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TABLE OF CONTENTS

LIST OF FIGURES

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LIST OF TABLES

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ACKNOWLEDGMENTS

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I.   INTRODUCTION

A.   SCOPE OF THE THESIS

Since it was founded in 1802, the United States Military Academy (USMA) has been one of the most important U.S. Army officer commissioning sources. The main objective of this institution has been to train and educate future leaders. After completing a four-year academic program, its cadets have been trained to serve missions in almost every type of field as a platoon or company leader. As one of the oldest military academies, being a member of this family has always been regarded as an honorable status for its graduates. Despite these facts, beginning in the 1990's, the U.S. Army started to experience a loss of its Academy graduates in much higher rates than in previous years. Specifically, in 2005, the separation rate of USMA graduates reached 34.2%.[1] This indicates that more than one third of the class of 2000 left the Army at the first opportunity. Such a rate surprised many senior officers and has attracted the attention of decision makers.

The driving factors behind this separation behavior are: civilian job opportunities in corporate management; and jobs which provide better pay options and location stability for members' families and better career development for the future. Recent studies have found an additional factor that may explain high separation rates: the Army's operation tempo after the end of the Cold War.

Gulf War I, and the ensuing humanitarian and peace keeping operations to Somalia, Bosnia, and Kosovo, have kept U.S. Army troops away from the mainland and their loved ones for longer periods. After 9/11, the number of these deployments increased rapidly due to more intense operations in Afghanistan. Recent changes in the political environment and key players due to the Global War on Terrorism (GWOT) have proven that deployments will continue to be a part of life for all service members. Therefore, due to these recent developments in deployment cycles, retention has become a more serious problem.

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[1] Tom Shanker, 2006. Young officers leaving Army at a high rate. *New York Times*. April 10, 2006

B. THE PURPOSE OF THE STUDY AND RESEARCH QUESTION

The purpose of this study is to identify the main reasons for the separation of U.S. Military Academy graduates. This will be accomplished by investigating whether the increased frequency and length of deployment, due to the Global War on Terrorism, had any effect on separation at the end of the initial service obligation for USMA classes between 1994 and 2001. The methodology of the thesis is to estimate difference-in-difference models using logistic regression techniques. Two types of cohorts, those who were eligible to make the stay/leave decision before March 2003 and those who were eligible after March 2003 are compared by using this technique. The start of GWOT is defined as of March 2003. This is when U.S. troops first initiated Operation Iraqi Freedom. Therefore, the effect of GWOT is identified by comparing the probabilities of staying in the service between those who were eligible to make STAY/LEAVE decisions before and after March 2003.

The primary research question of this thesis is:

- Did deployments associated with the Global War on Terrorism affect retention decisions of USMA graduates?

A secondary research question is:

- What other factors might have affected the decision of officers to stay or leave?

C. ORGANIZATION OF THE STUDY

Chapter II gives background information and reviews some of the literature concerning operational tempo, deployment and officer retention. Chapter III gives brief information about the data and discusses the preliminary findings. The main hypothesis is also stated in Chapter III. Chapter IV explains methodology and identifies the variables. Chapter V presents the results of the analysis and tests. Chapter VI briefly states conclusions and provides policy recommendations.

II.   BACKGROUND AND LITERATURE REVIEW

A.   INTRODUCTION

This chapter has been designed to serve two primary purposes. One is to give some information about how an Academy graduate develops, what steps he/she goes through during his/her initial service obligation, how current deployment issues have affected these soldiers recently, and, finally, what factors affect the separation of Army officers. Another goal is to examine and discuss methodology and findings of previous studies. In section B, the USMA is examined based on its education and training structure in three main areas: academic; military; and physical. Second, an officer's career path is examined and the milestones are analyzed. Third, current deployments in Iraq and Afghanistan, which are believed to be an important reason for the separation of Academy graduates, are examined. The final part of section B discusses factors affecting separation of Army officers after the initial obligation expires. In section C, previous studies pertaining to both officer and enlisted retention issues are examined and compared.

B.   BACKGROUND

1.   The United States Military Academy

When initially founded, the primary goal of the Academy was to educate and train the cadets as engineers and, after graduation, to send them to different construction zones across the country. At that time, the only curriculum in the Academy was civil engineering. The young lieutenants were primarily responsible for the construction of new railroads, bridges, harbors and roads all over the country. The biggest challenge for the new officers occurred when the Civil War started in the 1860's. Luckily, both tactic and strategic success gained during the war by Academy graduates proved the quality of the Academy to the nation. The increasing importance of the Academy in the public's eyes initiated new efforts to expand curriculums to include management and technical sciences

Both World War I and II contributed many academic, social and physical changes to the Academy. Following them, every development shifted and increased the quality

and shape of the Academy's education for over 50 years. However, the number of cadets has remained fairly constant since the 1960s. Each class begins with over 1,000 freshmen in the first year and with about 800 cadets graduating four years later. The overall student population is roughly 4,000 at any given time.

The Academy has a well-designed admission system that requires a candidate to meet academic, physical and medical qualifications. Applicants must be U.S. citizens, at least 17, but not yet 23 years of age on July 1st of the year of admission, be unmarried, and not be pregnant, or have a legal obligation, to support children. They are required to perform well on either the Assessment Program Test (ACT) or the Scholastic Assessment Test (SAT) and have good physical and mental health to pass the medical examination. In addition, they are required to pass the Candidate Fitness Assessment Test that consists of six elements, including a basketball throw, pull-ups, shuttle run, modified sit-ups, push-ups, and a one mile run.[2]

The difference between West Point and other academic institutions lies in its mission: "to educate, train, and inspire the Corps of Cadets so that each graduate is a commissioned leader of character committed to the values of Duty, Honor, Country and prepared for a career of professional excellence and service to the Nation as an officer in the United States Army."[3]

The Academy provides three major programs to prepare its cadets for the challenges of the future: academic, physical and military. Each is given equal importance in contributing to the cadet's education and training and its applications in the field.

With changes in the academic program more than a decade ago, the Academy has been providing education in more than a dozen fields, consisting of majors in engineering, math, humanities, and social sciences. The entire class graduates with a Bachelor of Science Degree that meets the requirements of today's Army. The four-year

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[2] United States Military Academy Admission Webpage http://admissions.usma.edu/FAQs/faqs_admission.cfm. (last accessed 09/2007)

[3] United States Military Academy Mission Webpage http://www.usma.edu/mission.asp. (last accessed 09/2007)

academic program consists of a core of 31 courses that provides education in both the arts and sciences. It is designed to provide cadets the opportunity to select and work on a specific study or an optional major.[4]

The physical program is designed to improve personal readiness for tough conditions that cadets should expect to face in the field. It consists of both educational classes and competitive athletics. Cadets are encouraged to participate in different sporting activities during each semester -- intercollegiate, club, or intramural level.[5]

The military program is more extensive during summer months. It starts with basic training in the first year and is followed by field training in the second year. The third and fourth years are spent in an actual unit somewhere in the world that helps cadets gain more real life experience. Military training is also combined with military courses, which provide an opportunity to reinforce learning skills and military leadership each semester. [6]

Moral and ethical development in the Academy is the center of all education effort. The honor code for a cadet states: "A cadet will not lie, cheat, steal or tolerate those who do."[7]The central fundamental values for cadets are duty, honor and country. The honor code and values are the core elements of the Academy that maintain integrity, trust and respect among cadets.[8]

> The Honor System depends more upon the Corps of Cadets than upon the supervision of the officers. Each year the cadets select from among themselves an Honor Committee for the purpose of interpreting the Honor System to the Corps of Cadets. The work of the Honor Committee includes the indoctrination of the new cadets in the principles of the Honor Code and the transmission of these principles from class to class. It acts as

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[4] United States Military Academy Academic Program Webpage http://www.dean.usma.edu .(last accessed 09/2007)

[5] United States Military Academy Physical program Webpage http://www.usma.edu/physical.asp (last accessed 09/2007).

[6] United States Military Academy Military Program Webpage http://www.usma.edu/military.asp (last accessed 09/2007).

[7] United States Military Academy Moral and Ethical Values Webpage http://www.usma.edu/Cpme/ (last accessed 09/2007).

[8] Ibid.

a grand jury reporting possible violations to the Commandant of Cadets. The Committee has no punitive powers and its functions being entirely investigative and advisory.[9]

After graduation, cadets are commissioned as second lieutenants and are obligated to serve for 5 years of active service. At the end of the 5 year period, they either extend their service or leave the Army with an obligation to serve 3 more years in a reserve component. Additionally, cadets are commissioned into a service branch combat arms, combat support, or combat service support upon graduation.

2. Career Development of Army Officers

Army officers, commissioned after graduation from Reserve Officer Training Course (ROTC), Officer Candidate School (OCS), or USMA, follow a 3-phase career development plan which includes, in order, basic branch, functional area, and career field designation. The career path for an officer starts with his basic branch upon commissioning and grows parallel with his/her desires and educational attainment. "The basic branch is a grouping of officers that comprises an arm or service of the Army and is the specialty in which all officers are commissioned or transferred, trained and developed."[10] The Army branches include infantry, armor, field artillery, air defense artillery, aviation, special forces, engineer, signal, military police, intelligence, civil affairs, adjutant, finance, chemical, transportation, ordnance, and quartermaster. All officers, after being commissioned, begin training and education on their designated branch in Officer Basic Schools. The Officer Basic Course (OBC) provides instruction on methods for training and leadership and prepares officers for first duty assignments. Depending on the intensity of the course, it takes anywhere from 4 to 6 months to complete. Upon completion, officers are sent to their initial assignments and stay there for another 2 to 3 years. Following promotion to Captain, officers attend the Captain Career Course (CCC) in their designated branch for another 6 months. This helps them

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[9] Maxwell D Taylor,. WestPoint honor system: Its objectives and procedures available from http://www.west-point.org/users/usma1983/40768/docs/taylor.html .

[10] Department of the Army. 2005. *Department of the Army pamphlet 600-3 commissioned officer professional development and career management.* 1st ed.

develop skills, acquire details of company level leadership, and train on technical and tactical use of the company. Selected captains can participate and train at schools other than their basic branch.

The second phase of the career path, functional area designation, occurs between the officer's 5th and 6th years of service. "Functional area is a grouping of officers by specialty (other than an arm, service or branch) who possess interrelated groups of skills and perform tasks that usually require significant education, training and experience."[11] The selection process, in principle, depends on both personal choice of the officer and academic and undergraduate degree among the same cohort. However, even after designated for a functional area, an officer stays focused on the company level service of the original branch. Upon completion of the Captain Career Course, most branches prefer that the officer serves in a company or battery for at least 18 months. Generally, a total of 8 years of service as an officer is required for branch qualification. In the next 4 years, other options for the officer are made available for continued career development. Some of these options are Advanced Civil Schooling, Training with Industry, and Army Acquisition Corps. These are primarily supplementary-type civilian education to enhance the knowledge and skills of officers and are not available for all officers.

In the final phase of the career path, officers are designated into one of 4 career fields following promotion to Major. The basic concept of Career Fields is to assign officers to a variety of assignments around their basic branch or functional areas. "The Career Field designation process determines in which specialty officers will continue their field grade development; either in their branch or in their functional area. All officers will be assigned to positions which require expertise in the particular specialty associated with each officer's designated Career Field."[12] In this phase of career development, officers are qualified to attend command and staff college. This prepares them for the duties of Majors and Lieutenant Colonels. By the time the officer completes this phase, the number of service years total 17 or 18. The officer then becomes eligible

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[11] Department of the Army. 2005. *Department of the Army pamphlet 600-3 commissioned officer professional development and career management*. 1st ed.

[12] Army commissioned officer career information career patterns webpage http://usmilitary.about.com/library/milinfo/arofficerinfo/blpatterns.htm (last accessed 09/2007).

to be promoted to Lieutenant Colonel when expected maximum contributions by the Army as senior staff officers and commanders. Table 1 presents the career path of an infantry officer as an example.

YEARS	0			10			20			30
Rank		LT	CPT		MAJ		LTC		COL	
			FAP							
			CFD							
Professional Military Education	O B C / B O L C	CCC		ILE			SSC			
Additional Training		Air Assault / Airborne / Ranger/ Bradley / Mortar Officer / Pathfinder / Long Range Surveillance								
		DEVELOPMENTAL & UTILIZATION ASSIGNMENTS								
Typical Assignments		•Platoon Leader •Specialty Platoon Leader (Scout, mortar) •Detach/Co XO •Ranger Regt (PL/XO/BN Staff)	•Company Commander •Battalion Staff •Brigade Staff •Ranger Regt (staff/2nd CMD) •CTC O/C •SGI •AC/RC •ROTC •USAREC CMD	•Battalion S3/XO •Brigade S3 •Div Chief of Plans •Div Chief of Ops •Ranger Regt (LNO/S3/XO/ Regt Staff) •CTC O/C •Joint/Army/MACOM Staff •AC/RC •ROTC			•Battalion Commander •Brigade XO •DIV G3 •TF Senior CTC O/C •AC/RC •ROTC PMS •Joint/Army/MACOM Staff		•Brigade Commander •TRADOC System Manager •DIV/Installation Chief of Staff •CDR, OPS GRP, CTC •Joint/Army/MACOM Staff		
Self Development	Baccalaureate Degree			Graduate Degree						

Table 1.   Infantry Officer Career Development Cycle

3. The Global War on Terrorism and Its Effect on Army Officers

The Global War on Terrorism (GWOT) was first initiated by the President of the United States following September 11, 2001. Its aim was to find and capture the terrorists who attacked the World Trade Center and Pentagon. In particular, its goals were to prevent the terrorist organizations from organizing any further activities, prevent cooperation between terrorist organizations, cut the support lines of such organizations, and, finally, to have a more secure and terror-free environment for every nation in the world. The U.S. Congress passed legislation that authorized the use of military force against these activities immediately after the President called for all nations to act against terrorism together. Following this call from the President, more than 120 nations have participated in the war against terrorism by providing all kinds of support when required. The first use of military force was deployed to Afghanistan in 2002 when the country was believed to be the primary supporter of the Al Qaeda organization. Because of that, it can be counted as the start of the GWOT. Operation Iraqi Freedom (OIF) followed Operation Enduring Freedom (OEF) and targeted many other terrorist cells in Iraq as well as the dictatorship of Saddam Hussein. Hussein had been dictator of Iraq for over 20 years and consistently threatened neighboring Arab countries. Operations in Iraq and Afghanistan have been going on for almost 5 years and, as of September 8, 2007, the total fatalities of U.S. troops reached almost 4,300.[13] Table 2 presents all casualties by service and component for each operation.

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[13] Defense Manpower, Data Center. Military casualty information http://siadapp.dmdc.osd.mil/personnel/CASUALTY/castop.htm (last accessed 09/2007).

GLOBAL WAR ON TERRORISM CASUALTIES BY MILITARY SERVICE COMPONENT -- ACTIVE, GUARD and RESERVE October 7, 2001 Through September 8, 2007												
		Army			Navy		Marines		Air Force			Totals
OIF/OEF	CAS TYPE	USA	ARNG	USAR	USN	USNR	USMC	USMCR	USAF	ANG	USAFR	
OIF TOTALS		15,901	4,124	1,250	549	123	8,128	1,169	281	61	17	31,603
OIF	Hos Death	1,750	335	90	41	17	694	125	24	0	0	3,076
OIF	Non-Hos Dth	356	100	36	22	3	134	12	10	2	4	679
OIF	WIA	13,795	3,689	1,124	486	103	7,300	1,032	247	59	13	27,848
OEF TOTALS		1,398	245	74	42	1	139	5	94	5	0	2,003
OEF	Hos Death	169	34	11	15	1	10	0	9	1	0	250
OEF	Non-Hos Dth	94	21	11	15	0	25	3	17	0	0	186
OEF	WIA	1,135	190	52	12	0	104	2	68	4	0	1,567

USA=Army Active; ARNG=Army National Guard; USAR=Army Reserve; USN=Navy Active; USNR=Navy Reserve; USMC=Marine Corps Active; USMCR=Marine Corp Reserve;

USAF=Air Force Active; ANG=Air National Guard; USAFR=Air Force Reserve

OIF=Operation Iraqi Freedom; OEF=Operation Enduring Freedom; Hos=Hostile; Non-Hos=Non-Hostile; WIA=Wounded in Action

Source: Defense Manpower Data Center

Table 2.   Casualties in OIF/OEF

Table 3 depicts the number of daily attacks by insurgent and militias in Iraq between June 2003 and April 2007. There has been a considerable increase in the amount of insurgent attacks, beginning in June 2006. Accordingly, this increase has also resulted in more civilian and military casualties (both dead and wounded), when compared to previous periods. As a result of this development, the U.S. Congress decided to increase the number of troops, starting from January 2007, to try to stabilize Iraq. Table 4 depicts the increases of U.S. troops in Iraq since January 2007.
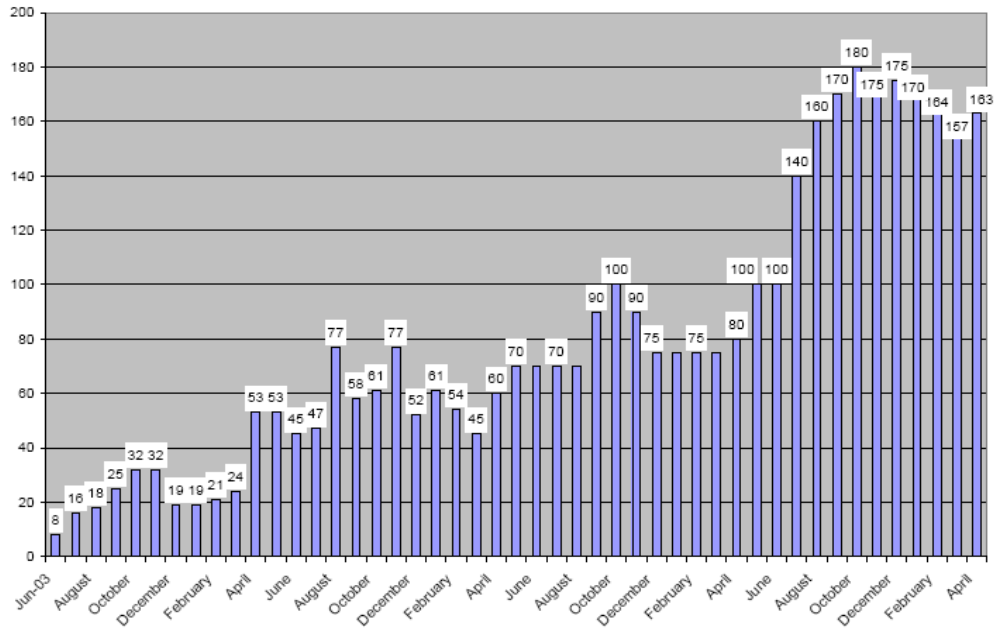
Table 3.   Number of Daily Attacks by Insurgent and Militias
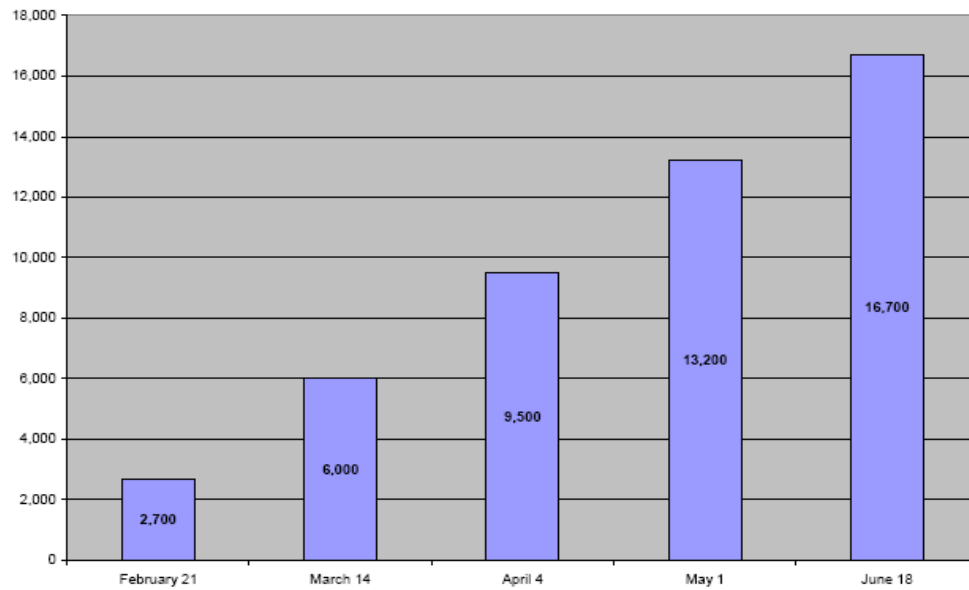
Table 4.   Number of New U.S. Troops Deployed to Baghdad

11

As of September 2007, the number of U.S. troops in Iraq and Afghanistan reached more than 140,000 and 18,000, respectively. Army active components constitute the majority of these troops.

Data published in March 2006 indicates that 273,268 active duty Army personnel (officer and enlisted) have been deployed at least once since September 11, 2001. 114,661 of these have been deployed more than once.[14] Normally, Army personnel are scheduled to deploy for 1 year; however, increases in deployment frequencies, due to operational manning requirement, cause some personnel to stay longer periods and experience multiple deployments.

4.   Retention and Factors Affecting the Decision to Leave

Employee retention is a key challenge for both civilian and military organizations and is crucial to the long-term health and success of organizations. Although some may consider retention of the best employees within the organization a costly decision, they must understand that it may be more costly to recruit and train new employees than to retain existing ones. Civilian firms and organizations have the advantage of lateral entry that helps prevent them from suffering employee shortages, while lateral entry is not common in the military. Civilians use this advantage by recruiting anybody, anytime, and at any level. However, with few exceptions, the military does not accept lateral entrants since the hierarchy and the job experience depends heavily on seniority. Therefore, it is far more important for the military to retain people for at least a certain amount of time. In addition to that, it is more costly to recruit and train people in the military than in civilian organizations. While the primary costs for civilian organizations occur in advertising, recruiting, and on-the-job training, the military incurs advertising, recruiting, instructor and facility costs, and the opportunity costs of hiring higher quality individuals. Based on this, keeping the separation rate low is an important aspect of cost savings for the military.

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[14] Charles A Henning,. 2006. *Army officer shortages: Background and issues for Congress.* Washington D.C.: The Library of Congress.

When considering all three Army officer commissioning sources, one can easily see that the graduates of USMA are far more costly than accessions from the other two sources. During training, while ROTC and OCS include primarily tuition costs and some stipends, the Academy also includes facility costs, instructor costs, and costs of extracurricular activities and military training costs. From both monetary and non-monetary aspects, Academy graduates are considered to be more valuable and are also very costly to replace.

Because of the differences in commissioning sources, the Army uses different service obligations (known as Active Duty Service Obligation) for different commissioning sources to recoup the investment costs. The obligation is 5 years for USMA graduates, 4 years for ROTC scholarship recipients, and 3 years for others (non-scholarship ROTC graduates, OCS graduates, and direct appointees).[15] Additional years spent in education programs during or after this obligation results in additional service obligations. Following the initial obligation, officers are offered to sign for another 3 or more years to serve in the active component. For the Army, the 5-year point is highly important, since it is the first signal of retention. The end of the active duty service obligation has been used as the main retention point by many published studies, as well as by this study

The primary factors affecting an officer's retention decision do not differ by commissioning source. The main factors are related to economic reasons, such as better job options with higher earnings and better living locations in the civilian sector. Others are satisfaction with military life, harmony of dependents with the military lifestyle, and stable duty locations. As recent developments have forced members to deploy more frequently and for longer periods, the desire to stay in a stable location has increased. Additionally, higher education gained by the member during their service makes them more marketable and valuable to the civilian sector. This increases the chance that they will seek other alternatives.

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[15] U.S., Department of Army. AR 350-100 officer active duty service obligation, in Department of Army.

13

Another aspect of the retention decision depends on psychological reasons. Every individual graduates from the school with great enthusiasm and is ready to serve for a lifetime career in the Army. However, this enthusiasm decreases over the years with various incidents and problems occurring in the units. Some of these are due to seniors' lack of leadership abilities; others are related to less effective and low quality subordinates. Unfortunately, these bad experiences cumulate over time and can lead to unwillingness to stay in the Army.

All of these reasons contribute to a low retention and can create manning shortages of experienced personnel. Eventually, low retention increases the level of required accessions and costs for the Army and negatively affects the operational efficiency of troops. Compared to the Military Academy, gaining personnel to ROTC is relatively easy. There is a cap for the population of USMA and the numbers above this cap can be detrimental to the quality of education. Therefore, losing a West Point graduate is more costly than losing an officer from other commissioning programs.

C.   LITERATURE REVIEW

In this section, previous studies pertaining to both officer and enlisted retention are examined. Retention is a major concern for both groups, but the reasons for leaving are not always the same. When comparing both groups, it is easy to capture a remarkable difference in future expectation and motivation as well as education level. Depending on these differences, both groups may have different reactions to increased levels of stress and workload (i.e., long working hours, long and frequent deployments, hard job conditions, inconsiderate superiors, etc.). Therefore, it is not possible to generalize the result of any study for both groups. However, since the main focus of this study is to examine West Point graduates' retention, it is appropriate and useful to understand and compare the methods and results of both enlisted and officer studies to provide adequate background for this study.

1.   "Serving Away From Home" by Hosek and Totten (2002)

In their research, Hosek and Totten hypothesized that there are both direct and indirect relationships between service members' decisions to reenlist and their

satisfaction with the type and frequency of deployments they experienced. They suggested that members learn and discover something new after every deployment. Each deployment, which includes characteristics of being away from the family, missing job-related opportunities on training, and operating in high risk missions, affect members differently. Besides these negative sides of deployments, for some members deployment increases personal fulfillment and motivation. These people see deployment as a necessary step for their career progresses. Therefore, based on this learning and gained utilities, if the member likes being deployed, they predicted he would stay in the service for another term; otherwise, the member would prefer to leave once he completed his initial obligation.

To explain this relationship, they followed a 2-stage methodology. In the first stage, they used the expected utility model to present how the feature of deployment can affect expected utility. In the second stage, they created two different probit models to explain the relationship between retention and different types of deployments.

In the first model, they examined the relationship between demographic, education, economic and deployment characteristics of the member and his reenlistment decision. Two separate specifications of deployment variables were used while estimating this model. For the first specification "main-effect specification," deployment variables indicated the number of hostile and non-hostile deployments. For the second model, deployment variables indicated combinations of both hostile and non-hostile deployments. Thus, all members who had both hostile and non-hostile experiences were considered in the second model. The deployment variables used in the first model reflected the direct relationship between reenlistment and deployment. On the other hand, Hosek and Totten also found an indirect relationship between them by examining the correlation between expected time for promotion to E5 and reenlistment as well as deployment and promotion to E5. They expected that if a member was deployed, it would also be a good indicator for promotion to E5.

The data, which was collected from DMDC (Defense Manpower Data Center), consisted of service members who faced reenlistment decision between fiscal years 1996 and 1999. It depended on 2 main data files: (a) the enlisted master file, and (b) the active

duty pay file. To identify the number of deployments by using the active duty pay file, Hosek and Totten counted the number of months deployed for every member over a 3-year period, ending 3 months prior to his/her decision to stay or leave. Two variables in the active duty pay file helped distinguish the members who had previously deployed and the number of their deployments. These variables were Family Separation Allowance (FSA) and Hostile Fire Pay (HFP). Basically, FSA paid for all missions and assignments, which included at least a 30-day separation from the family, while HFP paid for only the missions in or close to war zones, regardless of the duration. Therefore, these measures did not cover every type of deployment. Deployments that were training-related or that were routine assignments less than 30 days were omitted.

Findings from the first model (deployment-reenlistment model) indicated that reenlistment was higher among members who deployed compared with those who did not deploy. As the number of both hostile and non-hostile deployments increased, this effect remained positive, but tended to decrease. For example, while the marginal retention effect of non-hostile deployment was 0.265 for one deployment, it was 0.013 for 2 and 0.021 for 3.[16] This positive effect was also consistent, but less effective for hostile deployments. This result revealed that although members' utility increased with the deployments based on the expected utility model, this increase was not infinite and was limited to a certain number of deployments. Hence, one could expect higher reenlistment rates as the number of deployments increase.

The result of the second model (deployment-promotion and promotion-reenlistment model) indicated that a member with a deployment experience had a higher probability of being promoted earlier compared to his non-deployed peer. Specifically, for members who had 2 or more non-hostile deployments, promotion to E5 was a bit faster. On the other side, the effect of hostile deployments was smaller than non-hostile deployments. The hostile deployments sometimes increased promotion, but sometimes reduced promotion, and, thus, shortened or lengthened the time to promotion.

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[16] James Hosek and Mark Totten, *Serving away from home,* 2002. Santa Monica, CA, Rand Corporation.

The authors' effort to establish a direct causality between promotion-to-E5 and deployment might be considered a weakness. This is because one can easily notice other factors, such as effort and ability, affecting promotion to E5. Additionally, these factors are hard to measure and reflect in the model. Although use of AFQT scores as an instrumental variable for ability might account for some part of this correlation, lack of measurement for effort might still affect the results negatively.

2.   "The Effects of PERSTEMPO on Officer Retention in the U.S. Military" by Fricker (2002)

Upon surveying active duty personnel in 1999, one of the major concerns arose with the answer to the question "Which is the most important factor for leaving or considering to leave the military?"[17] Answers indicated that members believed deployment, which ranked in 5th place among 37 reasons, had a negative effect on the decision at the end of service obligation The result triggered Fricker, as well as many other researchers, to analyze the retention effects of deployment.

In his study, Fricker tried to find whether there was actually a negative relationship between deployment and retention. Based on the survey results, his hypothesis was that the lower retention of officers is associated with higher deployment levels.

His initial data, coming from the DMDC sources, included active duty officers serving between December 1987 and September 1999. He looked at all 4 military services separately to see whether there were any differences among them. He also separately examined junior (0 to 5 years of service) and midgrade (5 to 10 years of service) officers whose service obligations ended before September 1999. He looked at the follow-up year after the end of obligation year for each junior officer to determine whether he/she was still in the military. For junior officers, he estimated a logistic regression model. Since midgrade officers can leave the service at any time, he used a survival analysis technique to analyze retention of midgrade officers.

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[17] Department of Defense. 1999. *1999 Survey of Active Duty Personnel.* DoD.

To identify deployment, he used the same 2 measures -- Family Separation Allowances (FSA) and Hostile Fire Pay (HFP) -- as Hosek and Totten (2002). Both were constructed from the DMDC active pay file records, which gave monthly information for periods away from home. FSA reflected the longer periods (more than 30 days) away from family, while HFP was used to identify the excursions into hostile regions of the world. As a result, he described deployment as "either periods away from home in which the service member drew FSA or a period in which he/she drew Hostile Fire Pay.'[18] Additionally, he added demographic and educational characteristics, as well as occupational categories, to his model to examine their effects on retention. He identified 3 main reasons for adding occupational categories into the model. First, some officers (such as pilots) who were given special training before and after commissioning incurred longer initial service obligation periods. Second, some occupations, especially the technical ones, had better chances to find jobs in the civilian sector. Thus, these officers tended to leave as soon as the obligation ended to gain civilian experience and increase their earnings. Finally, differences in incentive pays across occupations could also cause some members to stay or leave.

Based on the location served during deployment, he evaluated the effect of two kinds of deployments: hostile and non-hostile deployments. Since both have different characteristics and mission specifications, he hypothesized they would have separate effects on retention. Depending on an officer career development plan, he asserted that hostile deployments meant more for the ones who were looking for a future military career. However, on the other side, he suspected lower retention if the hostile deployments became longer and more frequent. In the study, non-hostile deployments were also hypothesized to be a negative factor affecting retention, since it did not include any operational experience for future career enhancement.

His results showed that officers who participated in more non-hostile deployments had higher retention rates in all services. This was also valid for hostile deployments. Also, the magnitude of the coefficient was greater than for non-hostile deployments. This

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[18] Ronald D.Fricker. 2002. *The effects of perstempo on officer retention in the U.S. military.* Santa Monica, CA. Rand Corporation.

effect was different when comparing the hostile and non-hostile deployments for junior officers during the late 1990's. During that period, junior officers who experienced more hostile deployments had lower retention rates than the ones who experienced non-hostile deployments. Consequently, he admitted that the results of the 1999 survey and his main hypothesis might not be correct.

The shortcoming for the inability to measure the effect of short and unplanned deployments can be seen as one weakness for the study. Fricker assumed that these kinds of deployments were less predictable and mainly associated with routine activities and training. He admitted that they required a separate analysis since they might have a different effect on members. Consequently, he did not add these into the description of deployments. However, some of these deployments, which are short in nature, may be as difficult as the longer ones. Specifically, the frequent training assignments just before longer deployments or temporary missions in overseas may generate exhaustion of service members. On the other hand, the lack of non-hostile deployment measurement on single members generates another weakness for his study when the numbers of single members are considerably high for the junior officers.

Because of the data limitations, Fricker was unable to establish a causal relationship between deployment and retention. He only evaluated whether or not there was an association between them. Therefore, in interpreting the results, he avoided stating that the deployments cause the decreased officer retention.

3. "Effects of the Global War on Terror on Retention of Marine Corps Aviators" by Daniel Smith (2006)

In his Naval Postgraduate School (NPS) thesis, Smith discussed and evaluated the effects of deployment on the retention of Marine Aviators before and after 9/11. He described deployment as having received 3 consecutive months of Family Separation Allowance or 2 consecutive months of Imminent Danger Pay. He estimated 3 logistic regression models for each period (pre and post 9/11) separately. In the first model, he evaluated the effects of the total number of deployments on retention by using dummy variables for zero, 1, 2, and more than 2 deployments. In the second one, he discussed the

effects of non-hostile and hostile deployments by considering the total number of deployments for both types. In the third one, he evaluated the effects of combinations of non-hostile and hostile deployments on the retention.

The results of these three models on the pre -9/11 period indicated that individuals who have only one non-hostile deployment are less likely to stay than individuals with zero non-hostile deployments. Also, individuals with multiple hostile deployments appear to be more likely to stay than individuals with no hostile deployments. For the post-9/11 period, he pointed out that aviators deployed more frequently than they were deployed in the pre-9/11 period. Results of the post-9/11 period showed that increased operation tempo is negatively affecting the retention decision. Using interacted variables, his results indicated that deployments negatively affect retention among post-9/11 aviators. As a result, Smith found that the deployment schedules were constantly modified since 9/11 and created a negative effect on retention decisions of Marine Aviators.[19]

While many other studies found a positive relationship with increased personnel tempo, the results presented in this study look quite different. The possible reasons for this difference may be because of the variables, the time and specifications of data or the assumptions. One observed difference is the period described for the deployment in each study. In their studies, Hosek and Totten described deployment as 1 or more months receipt of either Family Separation Allowance or Imminent Danger Pay. Smith, however, described deployment as 3 or more consecutive months of FSA receipt or 2 or more consecutive months of Imminent Danger Pay.

4.   "Effects of the Global War On Terror on Medical Service Corps Retention Rates" by Erich J. Dietrich (2007)

In his Naval Postgraduate School (NPS) thesis, Dietrich analyzes the key factors affecting the retention of Medical Service Corps officers and measures the possible effects of GWOT on retention. He used DMDC data and added information on Medical Service Corps officers between 1997 and 2005. He estimated logistic regression models

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[19] B. Daniel Smith. March 2006. *The effect of the global war on terror on retention of Marine Corps Aviators*. Master's Thesis, Naval Postgraduate School, Monterey, CA.

by looking at demographic, education, experience and deployment characteristics of individuals in the same model. To attribute the effect of GWOT, he used the difference-in-difference analysis technique to estimate whether deployment increased the separation in pre- and post-GWOT period. He defined the start of GWOT as of March 2003 when U.S. troops first initiated Operation Iraqi Freedom. Design of the distinction between pre- and post-GWOT of his data analysis was dependant on the ending year of initial service obligation (4th year after being commissioned). The 1998 and 1999 cohorts, whose initial service obligation terminated before the fiscal year 2003, were defined as the pre-GWOT group, while the 2001 cohort was defined as the post-GWOT group. As indicated in the previous studies, Dietrich also classified the deployments as hostile and non-hostile for officers, based on the monthly information in pay records. He presented four models, including the same demographic and military experience variables, but differing only by deployment variable type.

In his preliminary data analysis, he found that the percentage of retention in the pre-GWOT group was 84.49%, while the percentage of retention in the post-GWOT group was 72.47%, signaling a possible effect of increased personnel tempo due to GWOT. His final findings, after the regression models, did not support his hypothesis that GWOT had an adverse effect on decisions to leave. Retention rates for the pre-GWOT period were 90.76% for those who deployed and 81.40% for those who did not.[20] This difference increased in his findings for the post-GWOT period, indicating a retention rate of 81.33% for deployers versus 68.60% for non-deployers. Thus, his findings suggested that deployments increased the job satisfaction and resulted with a higher retention. On the other hand, although his results were in favor of increased deployments, the difference-in-difference estimators were not statistically significant and had negative signs. Dietrich attributed this decrease on retention to other factors, such as alternative job opportunities for 2001, or increased work stress. Finally, his results supported previous studies that found deployment had a "positive effect on job

[20] Erich J. Dietrich,. March 2007. *Effect of the Global War on Medical Corps Retention Rate*. Master's Thesis, Naval Postgraduate School, Monterey, CA.

satisfaction and increased the level of personal fulfillment, thus, lead to the decision to stay more on the military" (Hosek, Kavanagh, Miller, 2006).

D.   SUMMARY

The purpose of this chapter was both to provide some background information on retention and to analyze previous studies pertaining to the retention effect of deployment -- either on overall military personnel or on specific specialties. Although all of the studies initially hypothesized that deployment had a negative effect on retention of service members, only one of them found a negative correlation in the data. To provide a better understanding of the four previous studies, I found it useful to summarize the key elements of each study. Table 5 lists the hypothesis of each study, the data source, the methodology, and the main findings.

Study	Hypothesis	Data	Methodology	Findings
Hosek and Totten (2002)	Effect of deployment on retention depends on service member's preferences and will have negative effect.	DMDC sources Enlisted Master File and Pay File Members who face reenlistment decision between FY1996 and FY1999	Expected utility model and Probit model. For direct effect: 1. Main-effect estimation (only for hostile and non-hostile deployments) 2. Combination of both hostile and non-hostile deployments For indirect effect: Correlation between expected time for promotion to E5	For direct effect: Reenlistment is higher for deployers. For indirect effect: Member with a deployment experience has a higher probability of being promoted earlier compared to his non-deployed peer.
Fricker (2002)	Deployment will reduce the retention of both junior and midgrade officers. The effects of hostile and non-hostile deployments differ	DMDC source Officer Master File and Pay File Active duty officers between December 1987 and September 1999 (all services)	For junior officers: Logistic regression models For midgrade officers: Survival Analysis	Officers who participated in more hostile deployments have higher retention rates in all services. During 1990's, junior officers who experienced more hostile deployments have lower retention.
Smith (2006)	Deployment reduces the retention of Marine Corps Aviators and the magnitude is different for pre- and post 9/11 period.	Three sources: DMDC (master file and pay file) Marine Corps Total Force Data Civilian airline industry Aviators between FY1995 to FY2005	Logistic regression models Demographic, military service characteristics, civilian economic conditions are independent variables Difference-in-difference estimation for 9/11 effect	Results indicate that deployments negatively affect retention among post 9/11 aviators.
Dietrich	Deployment	DMDC(Officer	Logistic Regression models	Deployments increase the

| (2007) | reduces the retention of Medical Service Corps officers and the magnitude is different for pre- and post GWOT period | Master File and Pay File) Health Manpower Personnel data System MSC officers between 1997 and 2005 | Demographic, military service characteristics, education characteristics are independent variables Difference-in-difference estimation for GWOT effect | job satisfaction and result with higher retention. Results of Difference-in-difference estimation has negative sign, but not statistically significant |

Source: Author

Table 5.   Summary of Previous Studies on The Retention Effect of Deployment

Deployments in previous studies are identified as either hostile or non-hostile ones. Additionally, some also considered the duration of deployment by adding deployed months to the main models. Interacted variables between hostile/non-hostile variable and GWOT are created to attribute the effect of GWOT. None of the studies predicted the retention effect of the duration and type of deployment together. Thurs, in this study, interaction variables between deployed months and deployment type are created to explain this issue.

Studies reviewed in this chapter revealed that understanding the effect of deployment on retention is crucial to determine future defense manning requirements. Specifically, considering the higher costs of West Point graduates, compared to other commissioning sources, retention effects become of major importance. Since, these officers are highly trained and well-educated; a minor change in their retention behavior means a lot for the Army. The goal of this study is to understand any adverse effects of deployment on retention, if there is one, and make necessary recommendations for decision makers, if needed. Similar to Smith's analysis on Marine Corps Aviators, the analysis utilizes a logistic regression framework consisting of demographic, military, and deployment variables to discover their effects on the retention. A difference-in-difference estimator is also employed to calculate and compare the effect for pre- and post-GWOT period.

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III. DATA AND PRELIMINARY ANALYSIS

A. INTRODUCTION

The purpose of this chapter is to provide information about the data, discuss data limitations, and present some preliminary findings based on descriptive statistics and frequency distributions of variables.

B. DATA SOURCE

The data for this thesis comes from DMDC (Defense Manpower Data Center). It was constructed from three main datasets: The Officer Master File; the Active Duty Pay File; and the Separation File. Since the main focus of the study is USMA graduates and their retention behavior, the data is collected in a way that includes only information on Academy graduates who were commissioned between 1994 and 2001. At the beginning of the analysis, both data files were merged based on Social Security Numbers to create a single file to understand how many deployments individuals experienced and their retention decisions. From the total of 23,746 observations in the merged data file, 16,456 of them were deleted due to either lack of information or discrepancies among the values, leaving 7,290 observations for the analysis. In the final phase of data work, 905 aviation officers were also excluded from the data, leaving 6,385 observations in the final dataset.

1. Officer Master File

The Officer Master File (OMF) includes demographic information for every individual in the armed forces. It has been tracking all active duty personnel since 1971. It has approximately 100 data elements which describe different officer characteristics. In our analysis, we followed the Academy graduates between 1994 and 2001 and collected the information on both first and last appearance of each graduate in the OMF. Therefore, there is information on both graduation day and the last day he/she last appeared in the file. The last information was collected in August 2007 for all observations, except the ones who separated before this data. OMF elements selected for this study include sex, gender, education level, pay grade, entry date, marital status, number of dependents,

primary service occupation, and flying status code. Previous studies have shown that demographic characteristics are often significant predictors of retention behavior. In addition to what previous studies used, to account for their effects on retention, military branch and command codes are included. Specifically, the hypothesis is that members in different military branches have different civilian job opportunities. Therefore, this might be one of the primary factors that significantly affect his/her decision to remain in the Army. Factors that could vary over time, such as marital status, number of dependents, and education level, were set for the information on last appearance in the OMF (either at separation or August 2007).

2. Active Duty Pay File

The Active Duty Pay File provides information on basic pays, special pays, as well as additional payments made to each service member monthly. Deployment pay is a part of this additional pay. For this study, I was interested in both Family Separation Allowance (FSA) and Hostile Fire Pay (HFP) which are commonly used indicators of deployment. Table 6 presents characteristics of these types and identifies the qualifications for eligibility.

DEPLOYMENT PAY	CHARACTERISTICS AND CONDITIONS FOR QUALIFICATIONS
FAMILY SEPARATION ALLOWANCES (FSA)	A service member with dependents is entitled to a family separation allowance (FSA) of **$250 per month**. This is in addition to any per diem or other entitlements, such as family separation housing allowance presuming that: • Movement of dependents to the permanent duty station at Government expense is not authorized. This presupposes that the dependents do not already live at or near that station; • The member is on duty on board a ship away from the home port of the ship for a period of more than 30 continuous days; • The member is on temporary duty away from the permanent duty station for a continuous period of more than 30 days and the dependents do not live at or near the temporary duty station.
HOSTILE FIRE PAY (HFP)	A member of a uniformed service may be entitled to Hostile Fire and Imminent Danger pay at the rate of **$225** for any month in which he/she was entitled to basic pay and in which he/she was: • Subject to hostile fire or explosion of hostile mines; • On duty in an area in which he was in imminent danger of being exposed to hostile fire or explosion of hostile mines and in which, during the period he was on duty in that area, other members of the uniformed services were subject to hostile fire or explosion of hostile mines; • Killed, injured, or wounded by hostile fire, explosion of a hostile mine, or any other

	hostile action; or
	• On duty in a foreign area in which he was subject to the threat of physical harm or imminent danger on the basis of civil insurrection, civil war, terrorism, or wartime conditions.

Source: http://www.military.com/benefits/military-pay

Table 6.   Characteristics and Qualifications for Family Separation Allowance and Hostile Fire Pay

The study collected monthly information on FSA and HFP for each observation between the period October 1994 and August 2007 and identified deployment based on this information. For this analysis, the same criteria to measure deployment were used as in previous studies. Although DMDC has started gathering deployment information for personnel and building a deployment data file since 2004, it is new and not yet adequate for analysis. Therefore, it will probably take more time for DMDC to build a comprehensive data file which might help future studies.

3.   Separation File

In the analysis, two elements of this file are investigated. The first is the separation date which gives information the date the individual left the Army. This element is used while calculating the number of years of service before leaving. The Separation Reason, the second element of this file, helped to understand the reason for separation and discriminate between those who had other reasons to leave from the ones who left right after the initial service obligation. Since elements are coded differently for different cohorts (coding difference starts with 1997), a two-stage procedure was followed for identifying the ones who left the service following the end of initial service obligation. For the classes before 1997, the years of service were subtracted and, then, concentrated on the ones with separation code 5.[21] For the classes after 1997, the focus was on the ones with separation code 1.[22]

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[21] This code refers to "Early release in the national interest," but was previously (before 1997) used for the definition of "Expiration of term of service" in this dataset.

[22] This code refers to "Expiration of term of service."

On the other hand, during the first phases of the data analysis, there was a need to address another issue pertaining to identification of the time to separation. It is not reasonable to expect individuals to leave as soon as his/her service obligation ends. Separation is a process that takes some time. Some people might prefer to leave at the exact 5-year point, but some might not. This decision depends primarily on alternative civilian job opportunities or other future plans. Therefore, the assumption is that any officer who wants to leave following the initial service obligation will separate between the 5th and 6th year of service. Thus, this one year period allowed the analysis of both those who separated with the same reason in their 5th and 6th year. Fricker (2002) followed a similar methodology in his study. Below, Figure 1 is added to provide a better explanation of this assumption.
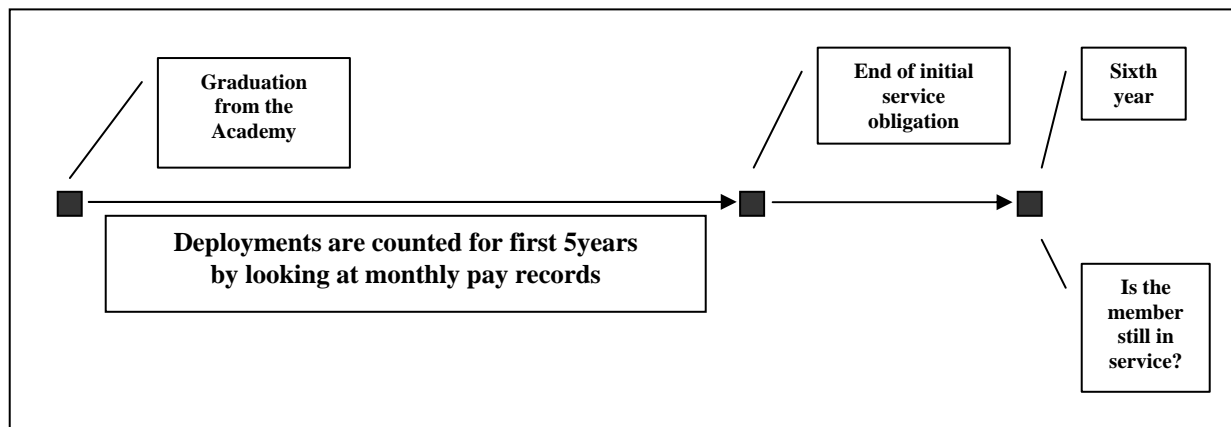
Source: Author

Figure 1.   Milestones of Separation for the Army officer

C.   DATA RESTRICTIONS AND LIMITATIONS

The data for the analysis was provided by Defense Manpower Data Center on October 2007. Therefore deployments following that time are not within the scope of this analysis. Also, the classes before 1994 are not examined in this study. The reason for excluding the period before 1994 depends primarily on the implementation of the downsizing policy in the military shortly after the end of the Cold War. In that period, the Army revised its future manpower requirements and decided to downsize one-third of the force. Thus, new incentives were put into effect to help officers to leave earlier in their career. This new policy also reduced the number of new accessions. Since the downsizing

effect lasted for another couple more years after the early 1990's, it was useful to start exploring the effect of deployment starting with the class of 1994.

In this study, the number and duration of deployments are identified by looking at the monthly pay records of every individual. FSA and HFP (described above in Table 6), two primary elements of active duty pay file, are utilized during this identification. However, as discussed in Fricker's (2002) analysis, single personnel are not eligible to get FSA pay, so officers without dependents have no values in their records even if they were deployed to non-hostile areas in a particular month. However, it is still possible to identify those single officers if they were deployed to hostile regions by their HFP. Moreover, it requires a continuous 30-day assignment to be eligible to receive the additional deployment pay. In some circumstances, it is possible that some officers were deployed less than that period and shown as "NOT DEPLOYED" in the pay file. In addition to these two problems, HFP may also undercount the number of deployments in a specific month when an officer experienced more than one deployment, but was recorded as having experienced only one deployment. Consequently, HFP only captures one deployment for every month and ignores additional deployments in the same month.

In addition, this data does not capture information on individuals who changed services during their careers. The method of collection of data allows us to work only with Army officers. Since the number of individuals who transfer is fairly small relative to the population, the assumption is that ignoring them will not effect this study's results.

Aviation officers who attend longer and more training cycles in their early careers are also not included within the scope of this thesis, since the initial service obligation for this group (8 years) is different from the other branches.

D.   DEFINING STUDY POPULATION

To evaluate the effect of GWOT on retention, the merged file was divided into two groups based on whether the decision to stay in the Army is made before or after GWOT. For this study, the beginning of GWOT was assumed to be March 2003 when Operation Iraqi Freedom (OIF) was initiated. It was after that time that many efforts to prevent global terror were concentrated and the number of deployments to both Iraq and

Afghanistan increased (see Table 3 in Chapter II). Therefore, officers whose active duty service obligation (ADSO) ended between 1999 and 2002 were identified as the pre-GWOT group, while the ones for whom ADSO ended between 2003 and 2006 were identified as the post-GWOT group.

E.   MAIN HYPOTHESIS

As discussed in the background part of Chapter II, the number of troops deployed to both Afghanistan and Iraq has increased. These increases were primarily the result of insurgent attacks which have dramatically increased in the last 2 years. As the number of troops increased, the duration and frequency of these deployments increased for both officers and enlistees. Consequently, the probability of experiencing more than one deployment for any officer is now higher than at anytime in the past. Although one can assert that deployments have positive effects on personnel by adding more experience, they also have some negative effects due to being away from family, missing some job related opportunities, and working in a high-stress and dangerous environment. In this study, it was hypothesized that the negative effects exceed the positive ones and, thus, there will be a negative relationship between deployment and retention behavior of Academy graduates. Additionally, as the number and frequency of deployments increase, retention will be negatively affected. It is also hypothesized that the coefficient of this negative correlation will increase after the start of Operation Iraqi Freedom.

F.   PRELIMINARY DATA ANALYSIS

The final dataset consisted of 7,290 observations (including the 905 aviation officers) for the classes of 1994 through 2001. To test whether this number is accurate, West Point library research center was contacted in October 2007.[23] Table 7 presents both the actual number of graduates and the numbers in this study's data. When considering both datasets, one can easily notice that the numbers are slightly different. Although this study's data has fewer observations than the actual, it contains more than

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[23] This data is taken from Maj. Harold La Rock , Chief of Institutional Research and Analysis Branch of United States Military Academy, October 10, 2007 in an electronic mail.

95% of the actual population. Possible reasons for this difference might be missing or dropped observations in this study's dataset.

Graduation Year	1994	1995	1996	1997	1998	1999	2000	2001	TOTAL
(a) Number of graduates from DMDC data	1008	900	910	881	862	913	926	890	**7290**
(b) Number of actual graduates	1038	1005	913	913	873	933	934	903	**7512**

Source: (a) Author's tabulations from DMDC data, (b) Maj. Harold La Rock, chief of USMA Institutional Research and Analysis

Table 7.　　Number of Graduates Between 1994 and 2001

As discussed in the previous part, aviation officers are not within the scope of this analysis. Therefore, these individuals were also dropped from the final dataset. Table 8 shows the number of graduates in the analysis sample for each class.

Graduation Year	1994	1995	1996	1997	1998	1999	2000	2001	TOTAL
Number of officers in final dataset	884	782	792	761	739	813	825	789	**6385**
Number of officers who left at the 5th year	250	298	247	250	263	294	340	329	**2271**
Percentage of leavers	28.2%	38.1%	31.1%	32.8%	35.5%	36.1%	41.2%	41.7%	**35.5%**

Source: Author's tabulations from DMDC data

Table 8.　　Number and Percentage of Officers Who Left at the 5th year Point

1.　　Dependent and Explanatory Variables

The dependent variable (LEAVE) is binary and indicates the officers who left the Army at the end of 5 or 6 years of service. As discussed previously, all officers, except Army aviators, are obliged to complete 5 years of service before being eligible to leave. Therefore, the dependent variable (LEAVE) takes the value of 1 if the officer leaves after

the 6th year, and takes the value of 0 if he/she chooses to stay in the 5th or 6th year. The distributions of the leavers are presented in Table 9.

The explanatory variables include demographic, military and deployment characteristics. Demographic characteristics include age, gender, race, ethnicity, marital status, and education level. The military characteristic includes military branch. Deployment characteristics are described as (deployed), (not deployed), (deployed to hostile area), (deployed to non-hostile area), (deployed to both hostile and non-hostile area), (number of months in hostile deployment) and (number of months in non-hostile deployment).

2.   Data Description by Year of Graduation

Table 9 provides descriptive statistics and frequency distributions of the population analyzed in this study by year of graduation. Since the main focus of this study is to compare the deployment effect in the pre- and post-GWOT period, similar descriptive statistics are presented for only these two periods in Table 10.

Characteristics	1994	1995	1996	1997	1998	1999	2000	2001	TOTAL
Separation Rate (%)	28.28	38.11	31.19	32.85	35.59	36.16	41.21	41.70	**35.57**
Age (mean)	29.2	29.1	29.3	29.2	28.6	28.7	27.9	27.5	28.7
Gender (%)									
Male	87.22	87.21	89.77	89.49	87.55	85.98	84.61	83.40	86.88
Female	12.78	12.79	10.23	10.51	12.45	14.02	15.39	16.60	13.12
Race (%)									
White	85.52	86.96	87.50	85.81	88.23	86.47	83.15	87.20	86.31
Black	6.22	6.39	7.45	7.36	4.87	6.40	7.27	6.46	6.56
Other Race	8.26	6.65	5.05	6.83	6.90	7.13	9.58	6.34	7.13
Ethnicity (%)									
Hispanic	3.51	3.96	3.79	4.07	4.06	3.32	4.24	4.56	3.93
Other Ethnicity	96.49	96.04	96.21	95.93	95.94	96.68	95.76	95.44	96.07
Marital/Dependency Status (%)									
Married with children	51.92	52.46	60.35	58.74	52.10	55.97	51.76	48.04	53.89
Married without children	5.43	4.99	3.28	5.26	4.47	4.92	4.97	5.83	4.90
Single with children	2.38	2.17	1.52	1.18	2.57	1.11	1.70	1.52	1.77

Single without children	40.05	40.28	34.85	34.69	40.73	38.01	41.58	44.61	39.37
Education Level (%)									
Baccalaureate Degree	78.28	82.86	78.54	82.65	85.12	84.99	88.73	90.75	83.93
Master's Degree or higher	21.72	17.13	21.47	17.34	14.89	15.01	11.27	9.25	16.07
Military Branch (%)									
Combat	68.55	65.22	75.00	73.85	73.34	69.62	72.48	71.36	71.12
Combat Support	11.65	18.03	13.38	14.45	12.99	13.90	13.94	17.24	14.41
Combat Service Support	19.80	16.75	11.62	11.70	13.67	16.48	13.58	11.41	14.47
Deployment (%)									
Deployed	78.73	88.11	88.26	64.39	72.67	93.11	95.76	96.70	84.90
Not deployed	21.27	11.89	11.74	35.61	27.33	6.89	4.24	3.30	15.10
Deployment Type(%)									
Only hostile deployment	9.84	6.78	7.83	25.62	28.96	0.86	0.61	0.63	9.84
Only non-hostile deployment	25.34	23.15	18.81	9.20	5.68	22.14	14.18	9.76	16.29
Both hostile and non-hostile deployment	43.55	58.18	61.62	29.57	38.02	70.11	80.97	86.31	58.78
Deployment(Hostile) %									
Hostile Deployments	53.39	64.96	69.44	55.19	66.98	70.97	81.58	86.95	68.61
No Hostile Deployment	46.61	35.04	30.56	44.81	33.02	29.03	18.42	13.05	31.39
Deployment(Non-hostile) %									
Non-hostile Deployments	68.89	81.33	80.43	38.76	43.71	92.25	95.15	96.07	75.07
No Non-hostile deployments	31.11	18.67	19.57	61.24	56.29	7.75	4.85	3.93	24.93
Months of hostile deployment (mean)	3.13	3.75	3.64	3.37	5.32	6.12	9.82	12.09	5.90
Months of non-hostile deployment (mean)	2.77	2.67	2.78	1.67	3.92	7.92	9.82	10.54	5.11

Source: Author's tabulations from DMDC data

Table 9.   Characteristics of USMA Graduate Officers Eligible to Make a Retention Decision

Characteristics	Pre-GWOT cohorts	Post-GWOT cohorts
Separation Rate (%)*	32.46	38.72
Deployment Rate(%)		
Deployed***	79.96	89.92
Not deployed***	20.04	10.08
Deployment Type(%)		
Only hostile deployment***	12.33	7.30
Only non-hostile deployment***	19.38	13.14
Both hostile and non-hostile deployment***	48.24	69.49
Deployment(Hostile) %		
Hostile Deployments***	60.58	76.78
No Hostile Deployment***	39.42	23.22
Deployment(Non-hostile) %		
Non-Hostile Deployments***	67.63	82.63
No Non-hostile deployments***	32.37	17.37
Months of hostile deployment (mean)+++	3.46	8.38
Months of non-hostile deployment (mean)+++	2.49	7.77
Age (mean)+++	29.22	28.21
Gender (%)		
Male***	88.38	85.34
Female***	11.62	14.66
Race (%)		
White	86.42	86.20
Black	6.83	6.29
Other race	7.52	6.74
Ethnicity (%)		
Hispanic	3.82	4.04
Other ethnicity	96.18	95.96
Marital/Dependency Status (%)		
Married with children***	55.76	51.99
Married without children	4.75	5.05

Single with children	1.83	1.71
Single without children***	37.56	41.22
Education Level (%)		
Baccalaureate Degree***	80.49	87.43
Master's Degree or higher***	19.51	12.57
Military Branch (%)		
Combat	70.58	71.67
Combat Support	14.29	14.53
Combat Service Support	15.13	13.80

Source: Author's tabulations from DMDC data

***	Pearson's Chi-Sq statistic significant at 0.01 level (Comparing pre- and post-GWOT)
**	Pearson's Chi-Sq statistic significant at 0.05 level (Comparing pre- and post-GWOT)
*	Pearson's Chi-Sq statistic significant at 0.10 level (Comparing pre- and post-GWOT)
+++	T statistic for difference in means significant at 0.01 level
++	T statistic for difference in means significant at 0.05 level
+	T statistic for difference in means significant at 0.10 level

Table 10.   Characteristics of USMA Graduate Officers Eligible to Make a Retention Decision in Pre- and Post-GWOT Periods

Analyzing the results of preliminary data helps to understand and evaluate the characteristics as well as retention behavior of groups in a better way. First of all, as stated in the main hypothesis, it was noticed that there is a significant difference in the probability of leaving at the initial decision point between the pre- and post-GWOT groups. The probability of leaving in pre-GWOT officers is 32.46% compared to 38.72% for post-GWOT officers. The increase is roughly 6 points. When the difference was tested between groups, the Chi-sq test result indicates that the difference is statistically significant. On the other hand, by looking at the mean of age for each group, it was noticed that there is a one year age difference between groups which is statistically significant. Although the admission requirements have not been changed for over 20 years, this might indicate that earlier age groups might have been more eager to join the

Army for the last 10-15 years compared to previous years. Furthermore, the results show that, over the years, there is a decline in male graduates compared to female graduates. The proportion of females increases from 11.62% to 14.66% for the last four classes. Two groups significantly vary for married with dependent and single without dependent. Officers who are married and have dependents account for 55.76% for pre-GWOT period. For post-GWOT period single officers without dependents decrease 4 percentage points compared to pre-GWOT period. This difference is statistically significant and indicates that officers in post- period are more reluctant to get married until their first decision point compared to their peers in pre- period. The difference might possibly depend on deployment frequency and duration. Specifically, the nature of hostile deployment might be an obstacle for officers to establish a family life, since it is hard for them to find the right person in a short amount of time between continuous deployments. Other marriage characteristics such as single with dependent and married without dependent, are almost similar for both periods and do not vary much between the two groups. Education is another element that changes between groups. Attaining higher education for an officer requires time, money, and effort while he/she is following daily routine schedule in the base. Therefore, as mentioned in marital status, it is hard to expect officers to attain higher education while they are deployed overseas, since they do not have enough opportunities to follow the classes. Results show that there is almost a 6% point decrease in attaining a Master's Degree between groups and this difference is statistically significant. On the other hand, even though this difference was found to be statistically significant, there is a general tendency to attain higher education for the classes 1994 through 1998. This is because this study followed these classes for longer periods than the post-GWOT cohorts in my dataset.

Among three different types of military branches, it was observed that none of them is remarkably different from the others for each period. Minor differences between two groups are not statistically significant. On the other hand, results indicate that deployment experiences vary between groups. Although both group members have deployment rates above 75%, the rate of deployment reaches almost 90% for the post-GWOT group. This is not an unexpected result, since it is known that deployment to Iraq

and Afghanistan is the biggest reason of this sharp increase. Looking at Table 9 gives more evidence on this sudden increase in deployments. Until the class of 1999, 70-75% of the officers on average for each class experience deployments in their first 5 years. The trend changes suddenly with class 1999 and jumps to 93% and keeps increasing gradually for the other two classes. It seems that not only hostile, but also non-hostile deployments, over the last few years contributed to this sudden change. Note that the rate of both types increases dramatically. Differences in hostile and non-hostile deployments, as well as the difference in rate of deployment, are statistically significant. It also seems that increases in the rate of being deployed affects the duration of deployments and extends the number of days in deployments. Average months in hostile deployments for pre-GWOT officers are roughly three times (3.46 months to 8.38 months) less than the post-GWOT officers. This fact also remains unchanged for the non-hostile deployments (2.49 months to 7.7 months).

3.   Data Description for Officers Leaving at the Initial Point

In Table 9 and Table 10 above, the results of descriptive statistics for the whole population are presented. Numbers in these tables identify the behavior of all graduates of the Academy. Table 11 presents the numbers for those who left at the initial point. Thus, it gives more comprehensive evidence on how officers who left at the 5- year point reacted to recent increase on deployments.

Characteristics	Pre-GWOT Period	Post-GWOT Period
Separation Rate (%)	32.46	38.72
Deployment (%)		
Deployed***	82.87	94.37
Not deployed***	17.13	5.63
Deployment Type (%)		
Only hostile deployment***	13.40	5.71
Only non-hostile deployment***	20.67	13.95
Both hostile and non-hostile deployment***	48.80	74.71
Deployment(Hostile) %		
Hostile Deployments***	62.20	80.42
No Hostile Deployment***	37.80	19.58
Deployment(Non-hostile) %		

Non-hostile Deployments***	69.47	88.66
No Non-hostile deployments***	30.53	11.34
Months of hostile deployment (mean)+++	3.66	8.90
Months of non-hostile deployment (mean)+++	2.36	7.90
Age (mean)+++	27.30	27.26
Gender (%)		
Male***	88.61	84.69
Female***	11.39	15.91
Race (%)		
White	88.33	87.52
Black	5.55	5.22
Other race	6.12	7.26
Ethnicity (%)		
Hispanic	3.54	3.92
Other ethnicity	96.46	96.08
Marital/Dependency Status (%)		
Married with children	45.65	44.45
Married without children	6.41	5.55
Single with children	1.34	1.55
Single without children	46.41	48.45
Education Level (%)		
Baccalaureate Degree**	97.51	95.60
Master's Degree**	2.49	4.40
Military Branch (%)		
Combat	67.37	69.00
Combat Support	16.56	16.39
Combat Service Support	16.08	14.61

Source: Author's tabulations from DMDC data
***   Pearson's Chi-Sq statistic significant at 0.01 level
        (Comparing pre- and post-GWOT)
**   Pearson's Chi-Sq statistic significant at 0.05 level
        (Comparing pre- and post-GWOT)
*   Pearson's Chi-Sq statistic significant at 0.10 level
        (Comparing pre- and post-GWOT)
+++   T statistic for difference in means significant at 0.01 level
++   T statistic for difference in means significant at 0.05 level
+   T statistic for difference in means significant at 0.10 level

Table 11.   Characteristics of USMA Graduate Officers Who Left at the Initial Decision Point
in Pre- and Post-GWOT Periods

Tabulations in Table 11 indicate that among those who left at the initial decision point, whites are 88% of pre-GWOT period leavers, while they are 87% of the post-GWOT period. The representation of other race and ethnicities is almost unchanged in each period. Another change occurs for those who left with Master's Degrees. Although the difference (2% points) does not appeal to be significant, 50% increase (from 2.49% to 4.40%) in this category indicates that, after completion of a Master's Degree, an officer is more eager to leave in the post-GWOT period compared to the pre-GWOT period. Although the number of officers with Master's Degrees seems to have decreased in the post-GWOT period (as discussed on pg.37, this is not an absolute decrease, since the number of individuals completing Master's Program within the first five years could not be restricted), the effect of completion increases. Deployment still seems to be one of the reasons for leaving as was observed over 18% points increase (%69.47 for pre-GWOT period and 88.66% for post-GWOT period) between the groups. An approximately 300% increase in average months in deployment, for both hostile and non-hostile deployment, seems to be a factor explaining the cause for the increase in the separation rate in the post-GWOT period.

4. Data Description by Number of Deployments

Alternative elements of data can provide evidence for different aspects of the study. Therefore, when looking at the number of deployments for each graduating class, it was noticed that a remarkable proportion of the sample experienced more than one deployment up to the initial decision point in the 5th year. This fact led to analyzing the effect of frequency of deployment in addition to type of deployment. Theoretically, based on the hypothesis, it is expected to see lower retention rates as the deployment frequency increases. Therefore, when comparing two officers with a different number of deployments, due to having higher combat exhaustion as well as higher stress, it is possible to see that the one with more deployment experience will have a higher probability to leave at the first opportunity. Because of this, Table 12 presents the number of deployments of those who left at the initial point for each graduating class and for each period and compares these numbers to hostile and non-hostile deployments (Table 13). In

addition to that, graphical distributions of this comparison are presented in Figures 2 and 3 below. Further discussion of the effect of increased number of deployments will also be discussed in the following chapter.

Number of Deployments	Pre-GWOT				Post-GWOT				TOTAL
	1994	1995	1996	1997	1998	1999	2000	2001	
No Deployment	188	93	93	271	202	56	35	26	964
1 deployment	212	170	146	144	123	142	94	74	1105
More than 1 deployment	484	519	553	346	414	615	696	689	4316
Total Number of Officers	884	782	792	761	739	813	825	789	6385

Source: Author's tabulations from DMDC data

Table 12.   Number of Officers Who Deployed for each USMA Graduating Class (1994-2001)

Number of Deployments	1994	1995	1996	1997	1998	1999	2000	2001	TOTAL
No Hostile Deployments	412	274	242	341	244	236	152	103	2004
1 hostile deployment	166	155	198	212	220	211	138	103	1403
More than 1 hostile deployment	306	353	352	208	275	366	535	583	2978
No Non-hostile deployment	275	146	155	466	416	63	40	31	1592
1 non-hostile dep.	269	313	271	186	176	431	462	462	2570
More than 1 non-hostile deployment	340	323	366	109	147	319	323	296	2223

Source: Author's tabulations from DMDC data

Table 13.   Number of Both Hostile and Non-hostile Deployments of Those Who Left at the Initial Point for Each USMA Graduating Class (1994-2001)

Tables 12 and 13 and Figure 2 provide clear evidence of an increased deployment tempo for the last three classes of Academy graduates. Specifically, the sudden changes in the number of deployments occur for the class of 2000. While the rate is 45% for the

members of class 1999, it goes up to 65% for the following class. This indicates that not only does the number of officers who experience deployment increase, but also frequency of deployment.

PERCENTAGE DISTRIBUTION OF HOSTILE DEPLOYMENTS FOR EACH CLASS

Source: Author's tabulations from DMDC data
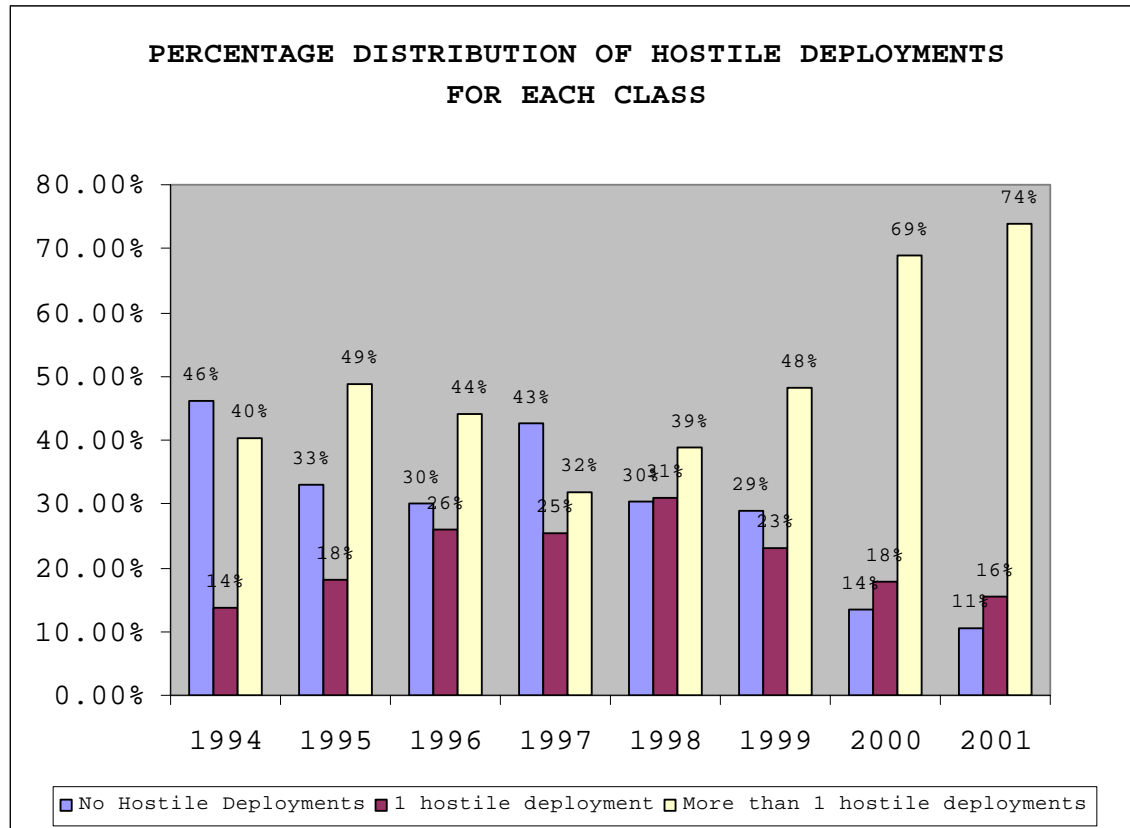
Figure 2.   Percentage Distribution of Hostile Deployments for each USMA Graduating Class (1994-2001)

From the non-hostile perspective, the situation is a bit different. Although the number of officers who experience non-hostile deployments increases dramatically over the years, it is hard to detect a sharp increase in the frequency. The number of officers who experience more than one non-hostile deployment almost remains the same over the years. On the other hand, the classes of 1997 and 1998 have surprisingly more officers who do not have any experience in non-hostile missions relative to other graduating classes.

PERCENTAGE DISTRIBUTION OF NON-HOSTILE
DEPLOYMENTS FOR EACH CLASS

Legend:
- No Non-hostile deployments
- 1 non-hostile dep.
- More than 1non-hostile deployments
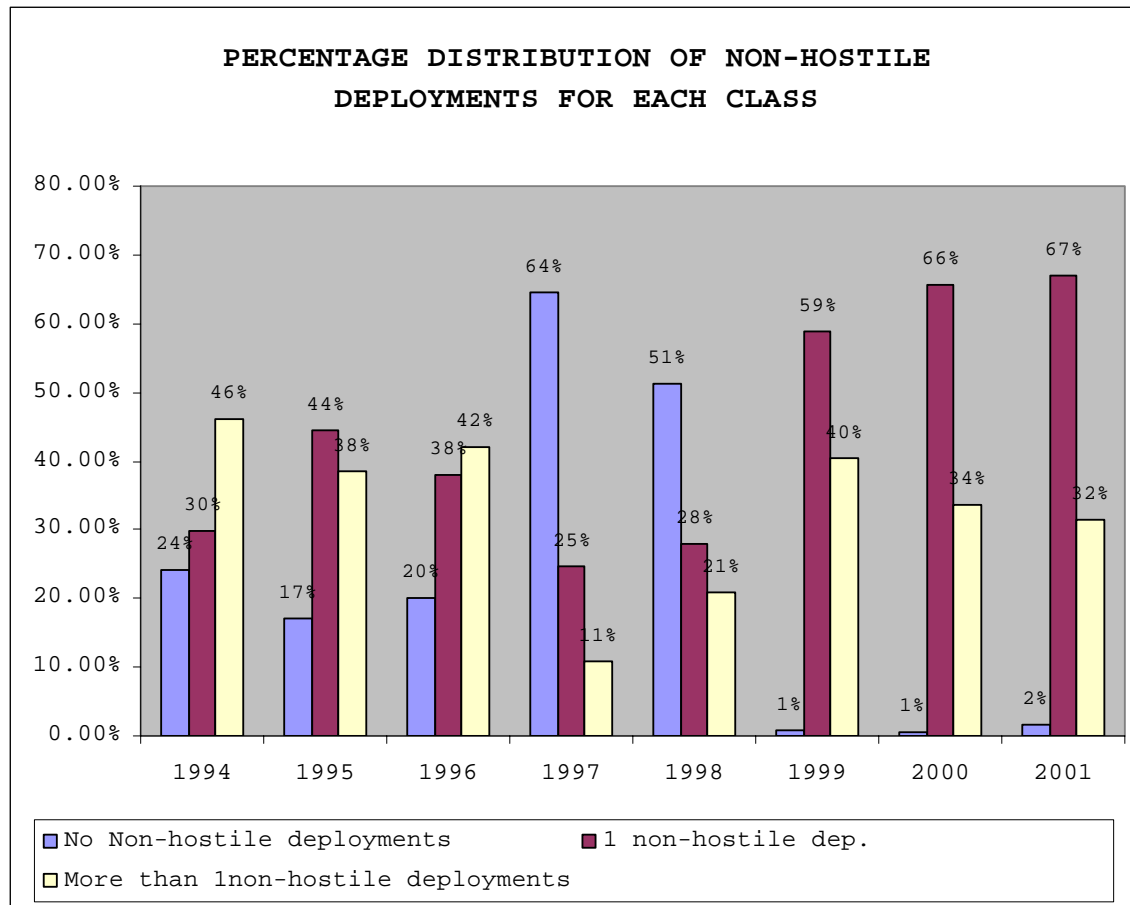
Figure 3.   Percentage Distribution of Non-hostile Deployments for each USMA
Graduating Class (1994-2001)

5.   Data Description on Duration of Deployments

Previous studies discuss the importance of duration of deployment as much as type of deployment. Logically, one can also expect to see that as deployments get longer they become harder for both the soldiers and their families. In addition to that, since deployments are generally planned as unit deployments in order to have better cohesion, some officers might have to serve longer terms when he/she is assigned to another unit which is already prepared for deployment when he is planning for the return. Tables 9, 10, and 11 show that average duration of deployment is almost three times higher for post-GWOT period than pre-GWOT. They do not give a clear explanation of the duration characteristics of deployments. Therefore, based on tabulations of the dataset, duration was categorized into three separate groups: 0 months deployed, 1-15 months deployed,

and deployed more than 15 months. This helped to understand whether there is a significant difference across groups and periods (pre- and post-GWOT). Table 14 presents the results of the three duration categories for both periods. Groups were created for different type of deployments to compare. Table 15 explains the same concept from the perspective of hostile and non-hostile deployments.

Deployment duration (%)	Pre-GWOT	Post-GWOT
0 months Deployed+++	20.04%	10.08%
1-15 months deployed+++	71.89%	38.95%
More than 15 months deployed+++	8.08%	50.98%

Source: Author's Tabulations from DMDC data

+++   T statistic for difference in means significant at 0.01 level
++   T statistic for difference in means significant at 0.05 level
+   T statistic for difference in means significant at 0.10 level

Table 14.   Distribution of Deployment Duration for Pre- and Post-GWOT Periods

The difference in mean length of duration between the two groups is statistically significant. Therefore, it seems that deployment duration has increased dramatically in the post-GWOT period.

Deployment Duration (%)	Pre-GWOT	Post-GWOT
0 months Deployed to hostile area+++	39.42%	23.22%
1-15 months deployed to hostile area++	58.87%	61.50%
More than 15 months deployed to hostile area+++	1.71%	15.29%
0 months Deployed to hostile area+++	32.37%	17.37%
1-15 months deployed to hostile area+++	66.42%	70.78%
More than 15 months deployed to hostile area+++	1.21%	11.84%

Source: Author's Tabulations from DMDC data

+++   T statistic for difference in means significant at 0.01 level
++   T statistic for difference in means significant at 0.05 level
+   T statistic for difference in means significant at 0.10 level

Table 15.   Distribution of Deployment Duration for Hostile and Non-hostile areas

G.   SUMMARY

The main focus of this chapter is to understand and analyze the dataset. By looking at the preliminary findings, it was observed that there is an unexpected increase in the separation rate starting with the graduates of 1998 (Table 10) at the initial decision point (i.e., the first cohort that makes the initial STAY decision after 2003). Results of demographic characteristics, such as education, marital status, and gender support, these findings and indicate that they might be the factors that contribute to the change in rates. In addition to that, significant differences between the frequency of hostile and non-hostile deployments for the focus groups helps to explain this increase in attrition level. Besides deployment among officers who left at the initial point, additional education contributes significantly to this change. Tabulations indicated that the number of officers who left with Master's Degrees has doubled for the post-GWOT period compared to pre-GWOT period. In the following two chapters, models to explain these differences are identified and assessed.

IV. METHODOLOGY AND IDENTIFICATION OF VARIABLES

A. ANALYTICAL METHOD

1. Theoretical Model

Probit models are utilized for this study. Probit models are designed for binary dependent variables which are bounded between zero and one. Instead of using linear probability models in which the predicted probabilities can drop below 0 or exceed 1 for some values, nonlinear models are used to restrict the predicted values to lie between 0 and 1. In this analysis, the binary dependent variable takes the value of 1 if the person leaves; otherwise it takes the value of 0. The theoretical model is:

(1) $\quad L_i = \ln(P_i / 1 - P_i) = \alpha + \beta\chi_i + e_i$

L_i = The log of odds ratio

P_i = Probability of a person leaves given characteristics x_i

α = Intercept parameter

β = The vector of the slope of independent variable coefficients

χ_i = Vector of independent variables

e_i = Error term

2. Multivariate Probit Regression Models

In this study, two sets of multivariate probit regression models (each set has three separate models) are specified to identify the retention effect of deployment. In the first set, the effect of deployment in three separate models is estimated. The first model will help to get an idea how deployment affects officers and how its effect differs between the periods (pre- and post-GWOT) (The start of GWOT is defined as of March 2003). This model is called the 'General Deployment Model'. The second model will explain whether the frequency of deployments has an adverse effect. The last model will account for how the duration of the deployments affect retention. The second set of models is organized to

understand whether there are differences between two types of deployment: deployments to hostile regions vs. non-hostile. Since hostile and non-hostile deployments have different characteristics, it is expected that their effects will also be different on officers. For the second set, three models are estimated. The first model aims to explain the type of deployment. Therefore, hostile and non-hostile deployment variables are added as well as the interaction of these two types of deployment with the post-GWOT period. The duration of deployment is examined in the second model by adding a variable which describes the number of months in each deployment type. The goal of the third model is to examine both the frequency and type of deployment. Therefore, an interaction between type and number of deployments[24] is added to the general deployment model to address this issue. Additionally, a post-GWOT variable is added for each deployment model to predict the deployment effect for the post-GWOT period.

3. Model with General Deployment Characteristics

a. *General Deployment Model*

This initial model is used to predict the probability of leaving for those who deployed at least once, regardless of type and duration of deployment. The Post-GWOT variable is added to reflect the difference between cohorts who made the first STAY/LEAVE decisions before or after GWOT. DEPLOYED is the variable used to identify the deployment. An interaction of DEPLOYED and the Post-GWOT period is also included to explain the deployment effect for post-GWOT period. The coefficient of this variable provides a difference-in-difference estimation. Equation (2) is the model to explain deployment effect.

(2) $\ln(P_i/1-P_i) = \beta_0 + \beta_1(\text{FEMALE}) + \beta_2(\text{BLACK}) + \beta_3(\text{OTHERRACE}) +$

$\beta_4(\text{HISPANIC}) + \beta_5(\text{MARRIED\_ WITH\_ CHILDREN}) +$

$\beta_6(\text{SINGLE\_ WITH\_ CHILDREN}) +$

$\beta_7(\text{MARRIED\_ NO\_ CHILDREN}) +$

---

[24] The number of deployment variables is determined based on the tabulations in Chapter III. In Table 12, the number of deployments for each class is presented.

$$B_8(\text{MASTER DEGREE}) + B_9(\text{COMBAT\_SERVICE\_SUPPORT}) +$$

$$\beta_{10}(\text{COMBAT\_SUPPORT}) + B_{11}(\text{DEPLOYED}) +$$

$$\beta_{12}(\text{POST\_GWOT}) + \beta_{13}(\text{DEPGWOT}) +$$

Where:

FEMALE=1 if the person is female; =0 otherwise

BLACK=1 if the person is African American; =0 otherwise

HISPANIC=1 if the person is Hispanic; =0 otherwise

OTHER RACE=1 if the person is of other race; =0 otherwise

MARRIED_ WITH_ CHILDREN=1 if the person is married and has dependents; =0 otherwise

SINGLE_ WITH_ CHILDREN=1 if the person is not married but has dependents; =0 otherwise

MARRIED_ NO_ CHILDREN=1 if the person is married but has no dependents; =0 otherwise

MASTER DEGREE=1 if the person has Master's Degree or higher; =0 otherwise

COMBAT_SERVICE_SUPPORT=1 if the person is in one of combat service support branch; =0 otherwise

COMBAT_SUPPORT=1 if the person is in one of combat support branch; =0 otherwise

DEPLOYED=1 if the person has ever deployed; =0 otherwise

POST_GWOT=1 if the person graduated from Academy after 1997; =0 otherwise

DEPGWOT= The effect of treatment for deployed personnel

(=DEPLOYED * Post-GWOT)

b.   *Deployment Frequency Model*

Deployment is a part of on-the-job training for soldiers. It helps them to get more experience and knowledge without studying tactics and techniques in the classroom. Many soldiers would like to experience deployment at least once. Depending on their expectations of the future, some may prefer more. Therefore, it is also related to the expected utility of the officers. As Hosek and Totten (2002) discussed in their studies, the utility goes up to the point where the individual desires additional deployments. For this study, it is not expected that a young officer, who is trying to survive in a different environment than school, to be fond of frequent deployments at his/her first 5years -- although deployment is a good sign for commitment. Table 12 presents the number of deployed officers for each graduating class. Based on what Table 12 shows, it was decided to categorize the frequency. The reference category was to have no deployment and the others were to have one and two or more deployments. Equation (3) is the model to account for deployment frequency:

(3) $\ln(P_i / 1 - P_i) = \beta_0 + \beta_1(\text{FEMALE}) + \beta_2(\text{BLACK}) + \beta_3(\text{OTHER RACE}) +$

$\beta_4(\text{HISPANIC}) + \beta_5(\text{MARRIED\_WITH\_CHILDREN}) +$

$\beta_6(\text{SINGLE\_ WITH\_ CHILDREN}) +$

$\beta_7(\text{MARRIED\_ NO\_ CHILDREN}) +$

$B_8(\text{MASTER DEGREE}) + B_9(\text{COMBAT\_SERVICE\_SUPPORT}) +$

$\beta_{10}(\text{COMBAT\_SUPPORT}) + \beta_{11}(\text{POST\_GWOT}) +$

$\beta_{12}(\text{DEPLOY\_1}) + \beta_{13}(\text{DEPLOY\_2MORE}) +$

$\beta_{14}(\text{DEPLOY\_1GWOT}) + \beta_{15}(\text{DEPLOY\_2MOREGWOT})$

Where:

DEPLOY_1=1 if the person deployed only once; =0 otherwise

DEPLOY_2MORE=1 if the person deployed twice or more; =0 otherwise

DEPLOY_1GWOT= The effect of GWOT for deployed once

(=DEPLOY_1 * Post-GWOT)

DEPLOY_2MOREGWOT= The effect of GWOT for deployed twice or more;

=0 otherwise (=DEPLOY2_MORE * Post-GWOT)

c.   *Deployment Duration Model*

Duration is another indicator that may have a significant effect on the decision to leave. Based on results of tabulations in Chapter III, three categories of duration were created. The base case is to have no experience on deployment. The other categories are "being deployed 1 to 15 months" and "deployed more than 15 months." Also included is the interaction of these variables with post-GWOT variable to allocate the effect of period. Equation (4) is the model account for deployment duration.

(4) $\ln(P_i / 1 - P_i) = \beta_0 + \beta_1(\text{FEMALE}) + \beta_2(\text{BLACK}) + \beta_3(\text{OTHER RACE}) +$

$\beta_4(\text{HISPANIC}) + \beta_5(\text{MARRIED\_ WITH\_ CHILDREN}) +$

$\beta_6(\text{SINGLE\_ WITH\_ CHILDREN}) +$

$\beta_7(\text{MARRIED\_ NO\_ CHILDREN}) +$

$B_8(\text{MASTER DEGREE}) + B_9(\text{COMBAT\_SERVICE\_SUPPORT}) +$

$\beta_{10}(\text{COMBAT\_SUPPORT}) + \beta_{12}(\text{POST\_GWOT}) +$

$\beta_{13}(\text{DEPLOY\_15}) + \beta_{15}(\text{DEPLOY\_15MORE}) +$

$\beta_{16}(\text{DEPLOY\_15GWOT}) + \beta_{17}(\text{DEPLOY\_15MOREGWOT})$

Where:

DEPLOY_15=1 if the person experienced 1 to 15 months of deployment;

=0 otherwise

DEPLOY_15MORE=1 if the person experienced more than 15 months of

Deployment; =0 otherwise

DEPLOY_15GWOT= The effect of GWOT for deployments up to 15 months

(= DEPLOY_15 * Post-GWOT)

DEPLOY_15MOREGWOT= The effect of GWOT for deployments more than

15 months (= DEPLOY_15MORE * Post-GWOT)

4. Models for Hostile versus Non-hostile Deployment

a. General Hostile Deployment Model

The difference between hostile and non-hostile deployment will have different effects on individuals. Besides these two groups, individuals who experience both types might also be expected to behave differently at the end of the initial service obligation point. Because of this, a combination of these two types is also added to Equation (5):

(5) $\ln(P_i/1-P_i) = \beta_0 + \beta_1(\text{FEMALE}) + \beta_2(\text{BLACK}) + \beta_3(\text{OTHER RACE}) +$

$\beta_4(\text{HISPANIC}) + \beta_5(\text{MARRIED\_ WITH\_ CHILDREN}) +$

$\beta_6(\text{SINGLE\_ WITH\_ CHILDREN}) +$

$\beta_7(\text{MARRIED\_ NO\_ CHILDREN}) +$

$B_8(\text{MASTER DEGREE}) + B_9(\text{COMBAT\_SERVICE\_SUPPORT}) +$

$\beta_{10}(\text{COMBAT\_SUPPORT}) +$

$\beta_{11}(\text{POST\_GWOT}) + B_{12}(\text{ONHOSTILE}) +$

$B_{13}(\text{ONNONHOS}) + B_{14}(\text{HOS\_NONHOS}) +$

$B_{15}(\text{ONHOSTILEGWOT}) + B_{16}(\text{ONNONHOSGWOT}) +$

$B_{17}(\text{BOTHGWOT})$

Where:

ONHOSTILE=1 if the person is deployed at least once to only a hostile area;

=0 otherwise

ONNONHOS=1 if the person is deployed at least once to only a non-hostile area;

=0 otherwise

HOS_NONHOS= 1 if the person is deployed both to hostile and non-hostile area;

    =0 otherwise

ONHOSTILEGWOT= The effect of GWOT for hostile deployment

    (= ONHOSTILE * Post-GWOT)

ONNONHOSGWOT= The effect of GWOT for non-hostile deployment

    (= ONNONHOS * Post-GWOT)

BOTHGWOT= The effect of GWOT for both deployment type

    (= HOS_NONHOS * Post-GWOT)

b.   *Hostile Deployment Duration Model*

When analyzing the duration of deployment, three categories are created. An interaction of type and duration of deployment is also added to account for the treatment for post-GWOT period. Equation (6) shows the effect of duration of deployment on retention rate.

(6) $\ln(P_i/1-P_i) = \beta_0 + \beta_1(\text{FEMALE}) + \beta_2(\text{BLACK}) + \beta_3(\text{OTHER RACE}) +$

$\beta_4(\text{HISPANIC}) + \beta_5(\text{MARRIED\_ WITH\_ CHILDREN}) +$

$\beta_6(\text{SINGLE\_ WITH\_ CHILDREN}) +$

$\beta_7(\text{MARRIED\_ NO\_ CHILDREN}) +$

$B_8(\text{MASTER DEGREE}) + B_9(\text{COMBAT\_SERVICE\_SUPPORT}) +$

$\beta_{10}(\text{COMBAT\_SUPPORT}) + \beta_{19}(\text{POST\_GWOT}) + B_{11}(\text{HOS\_15}) +$

$B_{12}(\text{HOS\_15MORE}) + B_{13}(\text{NONHOS\_15})$

$B_{14}(\text{NONHOS\_15MORE}) + \beta_{15}(\text{HOS\_15GWOT})$

$B_{16}(\text{HOS15MOREGWOT}) + \beta_{17}(\text{NONHOS\_15GWOT})$

$B_{18}(\text{NONHOS15MOREGWOT})$

Where:

HOS_15=1 if the person has served in a hostile area for 1 to 15 months;

=0 otherwise

HOS_15MORE=1 if the person has served in a hostile area more than 15 months;

=0 otherwise

NONHOS_15=1 if the person has served in a non-hostile area for 1 to 15 months;

=0 otherwise

NONHOS_15MORE=1 if the person has served in a non-hostile area more than

15 months; =0 otherwise

HOS_15GWOT= The effect of GWOT for those who have served between 1-15

Months in hostile area (=HOS_15 * Post-GWOT)

HOS_15MOREGWOT= The effect of GWOT for those who have served more

Than 15 months in hostile area (=HOS_15MORE * Post-GWOT)

NONHOS_15GWOT= The effect of GWOT for those who have served between

1-15 months in non-hostile area

(=NONHOS_15* Post-GWOT)

NONHOS_15MOREGWOT= The effect of GWOT for those who have served

More than 15 months in non-hostile area

(= NONHOS_15MORE * Post-GWOT)

c. *Hostile Deployment Frequency Model*

As discussed in the Chapter III, another possible reason for separation might be the frequency of deployments which an officer experienced in the first 5 years. The general expectation when graduating from the Academy is to experience one deployment until the end of 5th year. However, the preliminary data analysis showed that some officers have higher number of deployments than many of their peers. As a result of

these preliminary findings, Equation (7) below is analyzed to understand whether the frequency of deployment for two types of deployment is associated with recent retention behavior:

(7) $\ln(P_i / 1 - P_i) = \beta_0 + \beta_1(\text{FEMALE}) + \beta_2(\text{BLACK}) + \beta_3(\text{OTHER RACE}) +$

$\beta_4(\text{HISPANIC}) + \beta_5(\text{MARRIED\_ WITH\_ CHILDREN}) +$

$\beta_6(\text{SINGLE\_ WITH\_ CHILDREN}) +$

$\beta_7(\text{MARRIED\_ NO\_ CHILDREN}) +$

$B_8(\text{MASTER DEGREE}) + B_9(\text{COMBAT\_SERVICE\_SUPPORT}) +$

$\beta_{10}(\text{COMBAT\_SUPPORT}) + \beta_{11}(\text{POST\_GWOT}) + B_{12}(\text{HOSTILE1}) +$

$B_{13}(\text{HOSTILE\_1MORE}) + B_{14}(\text{NHOSTILE1})$

$B_{15}(\text{NHOSTILE\_1MORE}) + \beta_{16}(\text{HOS1\_GWOT})$

$B_{17}(\text{HOS1MORE\_GWOT}) + B_{18}(\text{NHOS1\_GWOT})$

$B_{19}(\text{NHOS1MORE\_GWOT}) +$

Where:

HOSTILE1= 1 If the person experienced 1 deployment; =0 otherwise

HOSTILE_1MORE= 1 If the person experienced more than 1 deployment; =0

otherwise

NHOSTILE1= 1 If the person experienced 1 deployment; =0 otherwise

NHOSTILE_1MORE= 1 If the person experienced more than 1 deployment; =0

otherwise

HOS1_GWOT= The effect of treatment for 1 hostile deployment

(= HOSTILE1 * Post-GWOT)

HOS1MORE_GWOT= The effect of treatment for hostile deployments more

than 1 (= HOSTILE_1MORE * Post-GWOT)

NHOS1_GWOT= The effect of treatment for 1 non-hostile deployment

(= NHOSTILE1 * Post-GWOT)

NHOS1MORE_GWOT= The effect of treatment for non-hostile deployments

more than 1 (= NHOSTILE_1MORE * Post-GWOT)

B. IDENTIFICATION OF VARIABLES

1. Explanatory Variables

In this analysis, three groups of explanatory variables are used to explain the retention behavior of Academy graduates: deployment-related, demographic and service characteristics.

a. *Deployment Variables*

(1) *Deployment indicator (DEPLOYED, NOT_DEPLOYED).* Previous studies discuss both the desirable and undesirable aspects of deployment. In general, three desirable aspects of deployment are commonly identified. In the first place, deployment is believed to distinguish the officer from his/her peers and trigger early promotion for the ones who are eager to serve overseas. Since the Army wants to create a difference between deployers and non-deployers, it prefers to use early promotion as a tool to motivate its officers to serve more frequently and effectively in overseas locations. Secondly, additional monthly payments for deployers and savings due to the nature of deployment constitute the monetary side of the issue. For example, a person who deployed to Iraq for a year gets an additional payment of approximately $3,000 ($225 hostile fire pay for each month). Since in most cases living in quarters and working 7/24 in a deployment zone requires few expenditures, the same person can save a large portion of the additional pay. This also depends on the dependency status of the person. If he/she is married, the savings might be much less than they are for a single person. Finally, some officers see deployment as a valuable experience for them and believe that it takes them out of their daily routine and involves them in the operational aspects of the military.

On the other hand, as undesirable aspects, officers are separated from their families for a period and might miss some job-related opportunities. Specifically, deployment might be an obstacle for a young LT completing his/her Master's Degree at the earliest possible time. At the same time, in some cases for some officers, personal expectations might turn into a disadvantage. Officers who graduate from a highly selective university might expect to earn a higher quality of life as compared to his/her peers in the civilian market. As a result, although previous studies discussed in Chapter II mention a balance between positive and neutral effects of deployment on retention, this study expects to observe a positive correlation between DEPLOYED and LEAVE variables. NON_DEPLOYED is used as the base group and includes the binary DEPLOYED variable in the general deployment model.

(2) *Deployment Location Indicator (NOT DEPLOYED, ONHOSTILE, ONNONHOSTILE, HOS_NONHOS).* This study categorizes the deployments into four groups. These are "having no deployment," "having only one hostile deployment," "having only non-hostile deployment," and "having both types of deployment." Hostile and non-hostile deployments have different characteristics. More commonly, in hostile deployments, individuals expect to serve in more hazardous locations and to take more risks as compared to non-hostile locations. Therefore, it is expected that each has different effects on the decision to leave. Due to the nature of hostile deployments, this study expects ONHOSTILE and HOS_NONHOS to have higher negative effects on retention. The base group is NOT DEPLOYED. In addition to all three categories, interactions of these three variables are used in the model to discuss the effect of treatment.

(3) Deployment Duration Indicator (DEPLOY_0, DEPLOY_15, DEPLOY_15MORE, HOS_0, HOS_15, HOS_15MORE, NONHOS_0, NONHOS_15, NONHOS_15MORE). Considering the tabulations (Tables 10 and 11) in Chapter III, this study noticed that the duration of both hostile and non-hostile deployments tripled in the post-GWOT period. This increase is observed not only for hostile, but also for non-hostile deployments. Based on the main hypothesis, as deployment gets longer it is expected for officers to have less desire to serve. Because of

that, this study believes there is a positive correlation between both months in hostile and non-hostile zones and the dependent variable (LEAVE). Three categories are generated to explain duration effect. These are DEPLOY_0, DEPLOY_15, and DEPLOY_15MORE. The base case is DEPLOY_0 which describes no deployment experience. For the second set of models (to compare differences between hostile and non-hostile deployment), six more variables are generated and added to the fifth model (Equation (6)) in the second set. The base cases for this model are HOS_0 and NONHOS_0.

(4)   Deployment   Frequency   Indicator   (NOT_DEPLOYED, DEPLOY1, DEPLOY_2MORE, NO_HOSTILE, HOSTILE1, HOS1_MORE, NHOSTILE1, NONHOSTILE1_MORE) .Tables in Chapter III indicated that as deployment got longer in the previous years, it also become more frequent. The frequency distribution presented in Table 13 also shows that the number of officers with more than one deployment in the first 5 years has increased dramatically. Therefore, this study expects a positive correlation between the frequency indicator variables and the dependent variable (LEAVE).

(5)   Interactions of deployment variables with Post-GWOT. These variables are generated by interacting the post-GWOT variable and deployment variables. They are used to identify the effect of Global War on Terror. A detailed explanation of these interaction variables is provided in Table 16.

Variable	Model Used	Interaction	Definition
DEPGWOT	Model 1 (Equation 2)	=DEPLOYED * Post-GWOT	=1 if the person is both deployed and in the post-GWOT group; 0 otherwise
DEPLOY_1GWOT	Model 2 (Equation 3)	=DEPLOY_1 * Post-GWOT	=1 if the person is both deployed once and in the post-GWOT group; 0 otherwise
DEPLOY_2MOREGWOT	Model 2 (Equation 3)	= DEPLOY_2MORE * Post-GWOT	=1 if the person is both deployed more than once and in post-GWOT group; 0 otherwise
DEPLOY_15GWOT	Model 3 (Equation 4)	= DEPLOY_15 * Post-GWOT	=1 if the person is both deployed for 1 to 15 months totally and in post-GWOT group; 0 otherwise
DEPLOY_15MOREGWOT	Model 3 (Equation 4)	= DEPLOY_15MORE * Post-GWOT	=1 if the person is both deployed

			more than 15 months totally and in post-GWOT group; 0 otherwise
ONHOSTILEGWOT	Model 4 (Equation 5)	= ONHOSTILE * Post-GWOT	=1 if the person is both deployed only to hostile areas and in the post-GWOT; 0 otherwise
ONNONHOSGWOT	Model 4 (Equation 5)	= ONNONHOS * Post-GWOT	=1 if the person is both deployed only to non-hostile areas and in the post-GWOT group; 0 otherwise
BOTHGWOT	Model 4 (Equation 5)	= HOS_NONHOS * Post-GWOT	=1 if the person experienced both type of deployments and in the post-GWOT group; 0 otherwise
HOS_15GWOT	Model 5 (Equation 6)	= HOS_15 * Post-GWOT	=1 if the person is deployed hostile areas 1 to 15 months totally and in the post-GWOT group; 0 otherwise
HOS15MOREGWOT	Model 5 (Equation 6)	= HOS_15MORE * Post-GWOT	=1 if the person is deployed hostile areas more than 15 months totally and in the post-GWOT group; 0 otherwise
NONHOS_15GWOT	Model 5 (Equation 6)	= NONHOS_15 * Post-GWOT	=1 if the person is deployed non-hostile areas 1 to 15 months and in the post-GWOT group; 0 otherwise
NONHOS15MOREGWOT	Model 5 (Equation 6)	= NONHOS_15MORE * Post-GWOT	=1 if the person is deployed non-hostile areas more than 15 months and in the post-GWOT group; 0 otherwise
HOS_1GWOT	Model 6 (Equation 7)	= HOSTILE1 * Post-GWOT	=1 if the person is deployed hostile area once and in the post-GWOT group, 0 otherwise
HOS1MORE_GWOT	Model 6 (Equation 7)	= HOSTILE_1MORE * Post-GWOT	=1 if the person is deployed hostile areas more than once and in the post-GWOT group; 0 otherwise
NHOS1_GWOT	Model 6 (Equation 7)	= NHOSTILE1 * Post-GWOT	=1 if the person is deployed non-hostile area once and in the post-GWOT group; 0 otherwise
NHOS1MORE_GWOT	Model 6 (Equation 7)	= NHOSTILE_1MORE * Post-GWOT	=1 if the person is deployed non-

			hostile area more than once and in the post-GWOT group; 0 otherwise

Table 16.   Interactions of Deployment Variables

b.   Demographic Variables

(1)   Gender (MALE, FEMALE). USMA started to accept female cadets in 1976 and, since then, roughly 15% - 17% of freshmen have been females. Based on Academy regulations, they are obliged to follow the same academic and military program as their male classmates, except they follow different standards on physical training tests. Although combat specialties were also opened to females previously, currently women can only serve in combat support and combat service support specialties. Women serve almost everywhere in the world and have the same opportunities for career progression as their male counterparts. Even though these equalities for men and women officers have been effective for so long, historically the military has always been male-dominated. This reality negatively affects the morale and motivation of female officers and perhaps reduces their desire to remain in the Army. Because of this reason, this study expects to find a positive correlation between FEMALE and LEAVE in the results. The base gender is selected as MALE for this study. The gender variable is FEMALE and it is binary.

(2)   Race/Ethnicity   (WHITE,   BLACK,   HISPANIC, OTHER_RACE, OTHER_ETHNIC). This study expects to have negative correlation between the variables of BLACK, OTHER_RACE, HISPANIC and LEAVE (dependent variable). WHITE and OTHER_ETHNIC variables will be used as the base group. All of the race and ethnicity variables are binary. If the member belongs to that group, it takes the value of 1; 0 otherwise.

(3)   Marriage   and   Dependency   Status   (SINGLE   NO CHILDREN,   SINGLE_   WITH_   CHILDREN,   MARRIED_   WITH_   CHILDREN, MARRIED_ NO_ CHILDREN). This study categorizes marriage and dependency status

into four dimensions. The base case is being both single and having no children (SINGLE NO CHILDREN). Other categories are SINGLE_ WITH_ CHILDREN (single with children), MARRIED_ WITH_ CHILDREN (married and having children), and MARRIED_ NO_ CHILDREN (married and no children). The focus group includes officers who are eligible to make a STAY/LEAVE decision at their 5th year. Five years after graduation is a short period of time for the officers who focus just on their early careers. This study believes that the primary goal of these officers in the early years of their career is either to get early promotions and progress in their careers or to get additional education and prepare themselves for the future. One can hypothesize that if the member is married and has dependents, his probability to stay increases. Looking for jobs in the civilian market requires time and effort and results sometimes in unemployment for a long period. The risk of being unemployed for a long period may induce them to stay in the military.

On the other hand, the principles of Labor Economics (Ehrenberg and Smith, 2006) state that people look for a more stable life. When there are dependents, the civilian market commonly provides this. Therefore, one might expect to see some officers prefer to leave early in order to enjoy more of this stability. Specifically, in recent years, due to an increase in the number of deployments, family life has become a big issue for service members. This study expects to see a negative correlation between MARRIED_ WITH_ CHILDREN, MARRIED_ NO_ CHILDREN, SINGLE_ WITH_ CHILDREN and retention (LEAVE) variable in the results.

(4)   Education (BA, MASTER DEGREE). MASTER DEGREE is binary and the Baccalaureate Degree is the base group. Officers graduate from the Academy with a Baccalaureate Degree at the end of 4 years. Not all, but some, can find opportunities to attain more education in the early years of their career. Some of the programs after graduation are funded by the Army; some are not. In most cases, those who follow funded programs are required to serve additional years on top of their initial service obligation. Since this thesis only looks at the 5-year point for all officers after graduation, graduates of funded programs are not within the scope of this thesis. Officers who attain Master or Doctorate Degrees by attending collages other than Army funded

programs spend both their money and leisure time to gain additional education. The reason for this effort might be to increase the probability of finding better jobs in the civilian market. As discussed by Ehrenberg and Smith (2007), investments in human capital are generally done by future-oriented people and these investments yield higher earnings in the future. Therefore, this thesis assumes that officers who attain higher degrees in the early years of their career are more likely to leave when their obligation is over. As a result of this, this study expects to have a positive correlation between MASTER DEGREE and LEAVE variable in the results.

c.   *Service Characteristics*

(1) Military specialties (COMBAT, COMBAT_SUPPORT, COMBAT_SERVICE_SUPPORT). The base group for this characteristic is COMBAT which identifies the people who are in combat specialties. COMBAT_SUPPORT and COMBAT_SERVICE_SUPPORT are the variables included in the models. Specialties in the Army are categorized in three main groups in the analysis. These are combat specialties, combat support specialties, and combat service support specialties. The specialties in each group are presented in Table 17. Each specialty has its unique characteristics and environment. Some require more field work, while others require more staff work. Not only the characteristics, but also the number of billets, are different for each specialty. Some specialties, especially in combat service support, have only a few billets in hazardous locations while others have many. Therefore, this thesis does not expect every specialty to have equal deployment experiences. Generally, deployment experiences for combat specialty officers are more likely than for other specialties. In contrast, there are differences between specialties in the availability of jobs in the civilian sector. Most commonly the technical branches, such as electronic, chemical, and finance, have had better jobs opportunities in the outside market. This can be counted as a negative factor for retention of combat service support personnel. Consequently, even though the possibility of finding jobs creates negative effects on combat service support officers, the combat specialties are the ones which bear the burden of deployments and, as a result, all expected to have lower retention rates

Combat Arms	Air Defense Artillery	5.12%
	Armor	13.02%
	Aviation	12.41%
	Corps of Engineers	11.93%
	Field Artillery	14.09%
	Infantry	18.13%
Combat Support Arms	Chemical Corps	4.29%
	Military Intelligence	2.70%
	Military Police	5.28%
	Signal	0.34%
Combat Service Support Arms	Adjutant General's Corps	0.97%
	Medical	1.04%
	Finance	1.89%
	Ordnance	2.92%
	Quartermaster	2.40%
	Transportation and Logistics	2.36%
	Others	1.08%

Source: http://www.eiu.edu/~armyrotc/Branches.html

Table 17.   Army Branches and Proportion Represented in the Dataset

2.   Dependent Variable (LEAVE)

The dependent variable (LEAVE) is binary. It takes a value of 1 if the officer leaves the Army after his/her initial decision point at the fifth year point. It takes a value of 0 if he/she stays beyond the fifth year.

C.   SUMMARY

The purpose of this chapter is to present the models and definition of variables utilized in the six different models employed in the study. The first one is the General Deployment Model which aims to distinguish the effect of deployment between the pre- and post-GWOT period. Additional models are generated to reflect the effect of type, frequency, and duration of deployment. LEAVE is used as the dependent variable for all models. Demographic, military, and deployment characteristics are the elements used to account for recent retention rates. The type and expected effects of each explanatory variable is summarized in Table 18 to provide a quick overview of the chapter.

Variable Name	Variable Type	Expected Sign
DEPLOYMENT VARIABLES		
Deployment Indicator		
NOT_DEPLOYED	Binary	Base Case
DEPLOYED	Binary	+
Deployment Location Indicator		
NOT_DEPLOYED	Binary	Base Case
ONHOSTILE	Binary	+
ONNONHOSTILE	Binary	+
HOS_NONHOS	Binary	+
Deployment Duration Indicator		
DEPLOY_0	Binary	Base Case
DEPLOY_15	Binary	+
DEPLOY_15MORE	Binary	+
HOS_0	Binary	Base Case
HOS_15	Binary	+
HOS_15MORE	Binary	+
NONHOS_0	Binary	Base Case
NONHOS_15	Binary	+
NONHOS_15MORE	Binary	+
Deployment Frequency Indicator		
NOT_DEPLOYED	Binary	Base Case
DEPLOY_1	Binary	+
DEPLOY_2MORE	Binary	+
NO_HOSTILE	Binary	Base Case
HOSTILE1	Binary	+
HOSTILE_1MORE	Binary	+
NO_NONHOSTILE	Binary	Base Case
NHOSTILE1	Binary	+
NHOSTILE_1MORE	Binary	+
GWOT Indicator		
PRE_GWOT	Binary	Base Case
POST_GWOT	Binary	+
Interaction variables		
DEPGWOT	Binary	+
DEPLOY_1GWOT	Binary	+
DEPLOY_2MOREGWOT	Binary	+
DEPLOY_15GWOT	Binary	+
DEPLOY_15MOREGWOT	Binary	+
ONHOSTILEGWOT	Binary	+

ONNONHOSGWOT	Binary	+
BOTHGWOT	Binary	+
HOS_15GWOT	Binary	+
HOS15MOREGWOT	Binary	+
NONHOS_15GWOT	Binary	+
NONHOS15MOREGWOT	Binary	+
HOS1_GWOT	Binary	+
HOS1MORE_GWOT	Binary	+
NHOS1_GWOT	Binary	+
NHOS1MORE_GWOT	Binary	+
DEMOGRAPHIC VARIABLES		
Gender		
Male	Binary	Base Case
Female	Binary	+
Race		
Other Race	Binary	Base Case
OTHER RACE	Binary	+
Black	Binary	-
Other Ethnic	Binary	Base Case
Hispanic	Binary	-
Marital/Dependency Status		
SIN_NOCH	Binary	Base Case
SINGLE_ WITH_ CHILDREN	Binary	-
MARRIED_NO_ CHILDREN	Binary	-
MARRIED_ WITH_ CHILDREN	Binary	-
Education		
BA	Binary	Base Case
MASTER DEGREE	Binary	+
MILITARY VARIABLES		
Military Specialty		
COMBAT	Binary	Base Case
COMBAT_SUPPORT	Binary	-
COMBAT_SERVICE_SUPPORT	Binary	-

Source: Author

Table 18.   Summary of Explanatory Variables and Expected Signs

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V. MULTIVARIATE ANALYSIS RESULTS

A. OVERVIEW

In this study, the primary goal was to find whether there is an association between demographic, service, deployment characteristics, and the decision to LEAVE at the end of the initial active duty service obligation for Academy graduates. The analysis dataset, requested from DMDC sources, consisted of three dataset files: Officer Master File, Active Duty Pay File, and Separation File. In addition to the DMDC variables, which were already in the dataset, a few interaction variables were created which allowed analysis of the effect of deployments for post-GWOT period.

The final dataset consisted of 6,385 observations after leaving out aviation officers (who have longer ADSO than other Army branches). Preliminary analysis presented in Chapter III gave insight into the effect of deployment. This study observed that the classes after 1997 have experienced longer and more frequent deployments compared to the previous four classes and the separation rate after ADSO for these classes are also much higher. Based on both this thesis' main hypothesis and the preliminary findings, this study created six probit models to test and analyze to see if the evidence on deployment effect is accurate. All models included the same demographic and military variables, but differed in the included deployment variables. To investigate for the difference between the two periods (pre-GWOT and post-GWOT), difference-in-difference estimation was used by adding interaction of post-GWOT and each deployment variable. Estimation results and accuracy of the models were tested by looking at Chow, likelihood-ratio, and pseudo-R square tests. The purpose of this chapter is to analyze and assess the results of regression models and present final findings.

B. NOTIONAL PERSON (BASE CASE)

In this study, the notional person is male, white, non-Hispanic, is single, with no dependents, has a Baccalaureate Degree, and is serving or served in combat arms. For deployment characteristics, the notional person is never deployed and is a member of pre-GWOT classes (1994, 1995, 1996, and 1997).

C. MODELS WITH GENERAL DEPLOYMENT CHARACTERISTICS

Three models are estimated to analyze the determinants of retention behavior of Academy graduates. The main model, called the "General Deployment Model," tries to explain whether "being deployed" is a significant determinant and whether, over time, there is a change in this determinant. The second model focuses on the effect of frequent deployments in addition to the effect of the main military and demographic characteristics. The third model is an alternative aspect of deployment which concentrates on duration. The post-GWOT variable and interactions between different deployment variables and the post-GWOT dummy are added for the difference-in-difference estimations. Table 19 presents results of these three models. For all models, marginal effects are presented instead of using the probit coefficient to provide an easy interpretation for the reader. (The results of full probit estimation models are provided in the Appendix) (See Table 16 for description of deployment variables)

	(1) General Deployment Model	(2) Deployment Frequency Model	(3) Deployment Duration Model
FEMALE	0.009	0.010	0.009
	(0.021)	(0.021)	(0.021)
BLACK	-0.084***	-0.083***	-0.084***
	(0.023)	(0.023)	(0.023)
OTHER_RACE	-0.050**	-0.050**	-0.050**
	(0.023)	(0.023)	(0.023)
HISPANIC	-0.019	-0.020	-0.019
	(0.031)	(0.031)	(0.031)
MARRIED_ WITH_ CHILDREN	-0.105***	-0.106***	-0.106***
	(0.013)	(0.013)	(0.013)
SINGLE_ WITH_ CHILDREN	-0.117***	-0.117***	-0.117***
	(0.040)	(0.040)	(0.040)
MARRIED_ NO_ CHILDREN	-0.010	-0.010	-0.010
	(0.029)	(0.029)	(0.029)
MASTER DEGREE	-0.321***	-0.321***	-0.321***
	(0.011)	(0.011)	(0.011)
COMBAT SERVICE SUPPORT	0.034*	0.034*	0.033*
	(0.020)	(0.020)	(0.020)
COMBAT SUPPORT	0.060***	0.059***	0.059***
	(0.019)	(0.019)	(0.019)
postGWOT	-0.096***	-0.097***	-0.097***
	(0.035)	(0.035)	(0.035)
DEPLOYED	0.094***		
	(0.020)		
DEPGWOT	0.145***		
	(0.037)		
DEPLOY_1		0.073**	
		(0.029)	
DEPLOY_2MORE		0.107***	
		(0.022)	
DEPLOY_1GWOT		0.168***	
		(0.050)	
DEPLOY_2MOREGWOT		0.138***	

			(0.039)
DEPLOY_15			0.098***
			(0.022)
DEPLOY_15MORE			0.107***
			(0.038)
DEPLOY_15GWOT			0.153***
			(0.042)
DEPLOY15MOREGWOT			0.141***
			(0.051)
Pseudo R2	0.0827	0.0831	0.0827
Prob > chi2	0.0000	0.0000	0.0000
Predicted probability of separation	0.3325	0.3325	0.3325
Probability of separation	0.3556	0.3556	0.3556
Observations	6385	6385	6385
Standard errors in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			

Table 19.   Estimated Marginal Effects for Separation Models with General Deployment Characteristics

1.   Interpretation of Demographic and Military Variables

Results indicate that gender (FEMALE) is not a key factor in the decision to leave. Although the coefficient has the expected sign, it is not statistically significant. Contrarily, race seems to have a significant effect on separation. African Americans and other minorities are more likely to stay after the 5th year compared to whites. An African American is 8.4% points and an officer from 'other' races is 5% points less likely to leave the Army compared to a white officer.

Marriage and dependency status was another factor that this study tried to explain while considering the decision to leave. Compared to the base case, which describes a single officer with no dependents, a married officer with dependents is 10.5% points less likely to leave. Surprisingly, this study found a positive relationship between separation and being single with dependents. It looks like, besides marriage, dependency status is also a key factor that affects an officer's separation decision.

For the effect of education, it was observed that not many people had a chance to attain higher degrees in their first 5 years. It was obvious that there was a general downward trend in advanced degrees during the post-GWOT period. Table 9 shows that 16.07% of the sample has completed at least a Master's Degree. Although it was expected that observation would show a positive correlation between MASTER DEGREE and separation, the result was the opposite. An officer with a Master or higher degree is 32% points less likely to leave compared to base case. As discussed in Chapter

IV, since the dataset did not provide the educational attainments for the first 5 years of all cohorts, it cannot be concluded that the coefficient of MASTER DEGREE reflects the truth. In other words, it is natural that an officer in pre-GWOT period is observed for a longer time interval than an officer in post-GWOT period; thus, there is a higher probability to attain a Master's Degree.

Among the three military specialty categories for the Army, this study selected combat arms as the base case. It was expected that officers in combat support and combat service support specialties would, after the initial point, have higher probabilities to stay. In contrast to expectations, combat support and combat service support specialties are more likely to leave the Army at the initial point. Compared to combat arm officers, officers in combat support branches are 6% points and officers in combat service support branches are 3.4% points more likely to leave.

2. Interpretation of Deployment Variables

In the first model, deployment is one of the key determinants of the decision to leave. An officer who deployed at least once has a probability of leaving the Army at the initial point that is 9.4% points higher than officers with no deployment experiences. The sign and magnitude of the coefficient is not the same for the post-GWOT variable which identifies whether an officer is a member of any graduating class between 1998 and 2001. The result indicates that an officer in the post-GWOT period is more likely to stay compared to the pre-GWOT period (regardless of deployment status). Finally, an interaction of these two key variables provides significant evidence that deployed officers in the post-GWOT period are more likely to leave the Army. An officer who deployed and in the post-GWOT period has a probability to leave the Army that is 14.5% points higher than officers in the base group. The interaction variable DEPGWOT indicates that deployments that occurred in the post-GWOT period had greater negative effects on retention relative to the pre-GWOT period. DEPGWOT has a positive coefficient and is statistically significant.

The second model tried to explain the effect of frequent deployments on retention. Therefore, officers are categorized as "never deployed," "deployed once," and "deployed

twice." It was expected the effects of these variables (DEPLOY_1 and DEPLOY_2MORE) to be positive on separation. The magnitude of the effect should increase as the number of deployments increased. The interaction of these variables was added with the post-GWOT variable to identify the possible effect of the post-GWOT period. The base case was "never deployed" for the model. Results indicated that there are significant differences between the three categories. An officer who deployed once is 7.3% points more likely to leave relative to base group. Additionally, the probability of leaving increases to 10.7% points for an officer who experienced two or more deployments. Besides these results, interactions also indicated that an officer in the post-GWOT period was more likely to leave relative to an officer in pre-GWOT period. The coefficient of the interaction of DEPLOY_1 with post-GWOT shows that there is a 16.8% point difference between two periods. However, the magnitude of the coefficient is 13.8% for DEPLOY_2MORE interaction. This suggests that the effect of deployment is similar regardless of frequency.

In the third model, as an alternative to deployment frequency, duration effect on deployment was analyzed. Similar to the frequency model, three categories for duration were created as well. The base case was again to be 'never deployed'. Other categories identified officers who deployed '1 to 15' or 'more than 15 months' of deployment. The results provide evidence that as deployment gets longer, it increases the probability to leave. However, the magnitude of the coefficients for both DEPLOY_15 and DEPLOY_15MORE are similar. Interaction of these variables to search for treatment effect also indicates that the duration does not matter much for an officer in the post-GWOT period as long as he experiences at least one month of deployment.

D. MODELS FOR HOSTILE VERSUS NON-HOSTILE DEPLOYMENTS

	(1)General Deployment Model	(4) General Hostile Deployment Model	(5) Hostile Deployment Duration Model	(6) Hostile Deployment Frequency Model
FEMALE	0.009	0.008	0.006	0.006
	(0.021)	(0.021)	(0.021)	(0.021)
BLACK	-0.084***	-0.085***	-0.087***	-0.085***
	(0.023)	(0.023)	(0.023)	(0.023)
OTHER_RACE	-0.050**	-0.049**	-0.047**	-0.048**
	(0.023)	(0.023)	(0.023)	(0.023)
HISPANIC	-0.019	-0.019	-0.018	-0.020
	(0.031)	(0.031)	(0.031)	(0.031)
MARRIED_ WITH_ CHILDREN	-0.105***	-0.115***	-0.115***	-0.109***
	(0.013)	(0.013)	(0.013)	(0.014)
MARRIED_ NO_ CHILDREN	-0.010	-0.013	-0.009	-0.009
	(0.029)	(0.029)	(0.029)	(0.029)
SINGLE_ WITH_ CHILDREN	-0.117***	-0.125***	-0.122***	-0.119***
	(0.040)	(0.039)	(0.039)	(0.040)
MASTER DEGREE	-0.321***	-0.321***	-0.322***	-0.321***
	(0.011)	(0.011)	(0.011)	(0.011)
COMSERV	0.034*	0.033*	0.032	0.034*
	(0.020)	(0.020)	(0.020)	(0.020)
COMBSUP	0.060***	0.059***	0.065***	0.061***
	(0.019)	(0.019)	(0.019)	(0.019)
PostGWOT	-0.096***	-0.097***	-0.083***	-0.082***
	(0.035)	(0.035)	(0.029)	(0.029)
DEPLOYED	0.094***			
	(0.020)			
DEPGWOT	0.145***			
	(0.037)			
ONHOSTILE		0.077**		
		(0.033)		
ONNONHOS		0.122***		
		(0.030)		
HOS_NONHOS		0.099***		
		(0.023)		
ONHOSTILEGWOT		0.031		
		(0.055)		
ONNONHOSGWOT		0.167***		
		(0.051)		
BOTHGWOT		0.156***		
		(0.040)		
HOS_15			0.016	
			(0.019)	
HOS_15MORE			0.051	
			(0.070)	
NONHOS_15			0.072***	
			(0.019)	
NONHOS_15MORE			-0.036	
			(0.088)	
HOS15GWOT			0.018	
			(0.030)	

HOS15MOREGWOT			-0.115*	
			(0.062)	
NONHOS15GWOT			0.145***	
			(0.033)	
NONHOS15MOREGWOT			0.238**	
			(0.106)	
HOSTILE1				-0.017
				(0.023)
HOSTILE1_MORE				0.043*
				(0.023)
NHOSTILE1				0.073***
				(0.022)
NHOSTILE1_MORE				0.058**
				(0.025)
HOS1_GWOT				0.041
				(0.037)
HOS1MORE_GWOT				-0.031
				(0.032)
NHOS1_GWOT				0.145***
				(0.036)
NHOS1MORE_GWOT				0.141***
				(0.040)
Observations	6385	6385	6385	6385
Predicted probability of separation	0.3325	0.3325	0.3325	0.3325
Probability of separation	0.3556	0.3556	0.3556	0.3556
Pseudo R2	0.0827	0.0854	0.0869	0.0849
Prob > chi2	0.0000	0.0000	0.0000	0.0000
Standard errors in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

Table 20.   Marginal Effects for Hostile and Non-hostile Deployment Separation Models

In models (4) to (6), I differentiate deployment type into deployments to hostile and non-hostile regions. For the fourth model, three new variables, which identify two kinds of deployment and a combination of both, were added. Interaction variables were also helpful to analyze the post-GWOT period effect. The base case for this model was 'not being deployed.' Results indicated that all three variables affected positively the decision to leave. Surprisingly, the effect of non-hostile deployment is higher than hostile deployment. As discussed in Chapter IV, it was expected that hostile deployments would have the longer effect since they are more tough and dangerous. An officer who deployed in only hostile areas is 7% points more likely to leave compared to base case. In contrast to expectations, this probability increases up to 12% points for an officer who has experienced only non-hostile missions. Besides that, when the post-GWOT effect was

analyzed, an officer who has experienced only non-hostile missions in the post-GWOT period is more likely (16.7% points) to leave relative to an officer in the pre-GWOT period. Results indicated that both hostile and non-hostile deployments negatively affect the decision to stay. Further, non-hostile deployments have greater effects on this decision compared to hostile deployments. The results also show that non-hostile deployments in the post-GWOT period have greater effect on the decision to leave than these in the pre-GWOT period. (See Table 16 for description of deployment variables)

For the fifth model, the duration for both hostile and non-hostile deployments was divided into three categories. The base category for each type was to have 'no deployment.' Other categories were to have '1 to 15 months' and 'more than 15 months' of deployment. The results of this model are similar to the third model. Hostile deployments do not have significant effect on the decision to leave. Although the coefficients are positive, they are not statistically significant. This is also valid for the post-GWOT period. Only hostile deployments for more than 15 months in the post-GWOT period seem to have a significant effect. On the other side, non-hostile deployments which last 1 to 15 months have a significant effect on decision to leave. An officer who served in non-hostile areas for 1 to 15 months is 7.2% points more likely to leave relative to the base case (officer without non-hostile experience). There is also an adverse effect in the post-GWOT period for officers who deployed in non-hostile areas for more than one month. Interaction variables indicated that as one stays more months in non-hostile areas, his/her probability to leave increases in the post-GWOT period compared to pre-GWOT period. An officer with more than 15 months experience in non-hostile area is 23% points more likely to leave relative to his peer in the pre-GWOT period. The adverse effect of non-hostile deployment is still consistent for this model as was discussed in the third model.

The purpose of the sixth model was to discuss the effect of frequency for both deployment types. The frequency of deployments was determined by looking at how many times an individual was sent to either hostile or non-hostile missions. Three categories were created to explain this. The base case was to have 'no experience' on any type of deployment. Others were to have 'one hostile' (or non-hostile) and 'two or more

hostile' (or non-hostile) deployments. Results indicated that experiencing more than one non-hostile deployment has an adverse effect on decision to stay. An officer with one non-hostile deployment is 7.3% points and one with two or more non-hostile deployments is 5.8% points more likely to leave the Army at the initial decision point compared to an officer in base case. Results of non-hostile deployments are greater for the post-GWOT period. An officer with one non-hostile deployment is 14.5% and other with two or more non-hostile deployments is 14.1% more likely to leave compared to base case for the post-GWOT period.(The results of full probit estimation for hostile vs. non-hostile models are provided in Appendix-A).

E.   VALIDATION OF EXPLANATORY VARIABLES AND DISCUSSION ON MODELS GOODNESS OF FIT RESULTS

1.   Likelihood Ratio Test

To validate the explanatory variables, the Likelihood-Ratio Test was employed in this study. This test is similar to the F-test in OLS regressions which tests the joint significance of all of the explanatory variables. With the application of Likelihood Ratio Test, the main predictors are tested jointly. As discussed in the previous part, type, frequency, and duration characteristics of deployment were found as the primary predictors of separation. Therefore, in this section, deployment variables of each model were grouped and tested separately. Results of this test indicate whether these variables are jointly significant to explain the change in dependent variable. The restricted model for all tests is the 'General Deployment Model' without variables of DEPLOYED and DEPGWOT. The null hypothesis is that the variables tested here are not jointly significant. The results are presented in Table 21. The results strongly reject the null hypothesis and indicate that all variables that were included in different models are jointly significant.

Model	LR chi2	Prob > chi2	Identification of Test Result
General Deployment Model	LR chi2(2) = 87.62	0.0000	Reject the null. The variables are jointly significant.
Deployment Frequency Model	LR chi2(4) = 90.99	0.0000	Reject the null. The variables are jointly significant.
Deployment Duration Model	LR chi2(4) = 87.70	0.0000	Reject the null. The variables are jointly significant.
General Hostile Deployment Model	LR chi2(6) = 110.67	0.0000	Reject the null. The variables are jointly significant.
Hostile Deployment Duration Model	LR chi2(8) = 123.12	0.0000	Reject the null. The variables are jointly significant
Hostile Deployment Frequency Model	LR chi2(8) = 106.10	0.0000	Reject the null. The variables are jointly significant.

Source: Author's Likelihood Ratio test results of DMDC data

Table 21.   Likelihood Ratio Test results for Models

2.   Chow Test

The Chow test was used to see whether there are significant differences between two periods (pre- and the post-GWOT). Similar to the F-test and Likelihood-Ratio Test, this test looks for joint significance of variables. The result of this test shows whether or not there are differences across time in slope, intercept, or both. The first model is the unrestricted model for this test. Exclusions are postGWOT, DEPLOYED, and DEPGWOT variables for the restricted model. The null hypothesis is that there is no difference between the two periods. Table 22 presents the result of the Chow test. The result indicates that there are significant differences between two periods in slope -- intercept or both.

Model	LR chi2	Prob > chi2	Identification of Test Result
General Deployment Model	Chi2(3) = 97.33	0.0000	Reject the null. There are significant differences between two periods in either slope -- intercept or both.

Source: Author's Chow test results of DMDC data

Table 22.   Chow Test Result for General Deployment Model

3. R square Test

The method used to assess model goodness of fit is based on the R squared value. In logit/probit models the basic R square is called the pseudo-R square. It basically measures the percent of the variation in the dependent variable depending on changes in explanatory variables. All six models have an average R square value of 8%. This indicates that explanatory variables in models explain roughly 8% of the variation observed in the dependent variable (LEAVE).

Model	Pseudo R square
(1) General Deployment Model	0.0827
(2) Deployment Frequency Model	0.0831
(3) Deployment Duration Model	0.0827
(4) General Hostile Deployment Model	0.0854
(5) Hostile Deployment Duration Model	0.0869
(6) Hostile Deployment Frequency Model	0.0849

Source: Author's Pseudo-R square test results of DMDC data

Table 23.   Pseudo R Square for Probit Models

F.   SUMMARY

The results of all models show that being deployed is a key factor in an officer's decision to leave. Initially, it was expected that hostile deployments would have a greater effect relative to non-hostile deployments. This author understands that hostile deployments were more difficult with more dangerous missions. This would possibly affect the decision to leave positively. Surprisingly, Results showed that non-hostile deployments have a greater effect on the decision to leave. In addition to that, non-hostile

deployments are more effective in the post-GWOT period relative to the pre-GWOT period. This conclusion is not consistent with the previous studies. Findings of almost all studies suggested that both hostile and non-hostile deployments increase job satisfaction and results in higher retention. One possible reason for this difference might be having different cohorts in this study than in earlier studies. Alternatively, identification of explanatory variables, which are slightly different than other studies, might also cause different results relative to other studies.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Retention is one of key factors for decision makers to consider while shaping the needs for future manning requirements. A good understanding of retention behavior provides important information for planning purposes. In other words, assessing historical patterns gives lots of clues for tomorrow. In this study, the goal was to investigate the retention behavior of Military Academy graduates in the recent past. With a prominent history, the military Academy has been a source for almost every well-known commandant in the history of U.S. Military. Some of these names are George Henry Thomas, Dwight Eisenhower, and H. Norman Schwarzkopf. In their times, these people, with their actions and decisions, not only shaped the U.S. Armed Forces, but also the United States of America and the world. Therefore, this author's understanding is that this institute not only educates the commandants of Army only, but also the country's future leaders. Any loss of its members could be highly detrimental to the U.S. Military, the nation, and the world.

To understand and evaluate the retention behavior of Academy graduates, officers who graduated between 1994 and 2001 were examined. This was because, after several years of downsizing, the transition to a new and active military was over with the beginning of 1993. The second reason for this restriction was to focus only on the period of recent wars in Afghanistan and Iraq. In comparison to other wars in the previous decade, these were implemented to fight against global terrorism and required long-lasting and frequent deployments for all service members.

Out of 7,512 officers who graduated between 1994 and 2001, 6,385 were examined in this study. Aviation officers were excluded. This was because it was the only Army branch requiring an ADSO (Active Duty Service Obligation) of more than five years. The primary focus was to investigate the retention behavior of these officers at their initial decision point -- 5 years after commissioning. Preliminary findings suggested that there is a sudden decrease in retention for the classes of 1999 and 2000. The

hypothesis of this thesis was that there might have been a correlation between recent deployments and these decreases in retention. Thus, two sets of models (six models in total) were estimated to examine whether such a correlation exists. To control the effect of other characteristics, demographic and military variables, such as gender, marital status, education, race, ethnicity, and military branch, were added to the multivariate models.

DEPLOYMENT VARIABLE	DEPLOYED OR NOT DEPLOYED	TYPE OF DEPLOYMENT	DURATION OF DEPLOYMENT	FREQUENCY OF DEPLOYMENT
MODEL 1				
DEPLOYED	0.094***			
DEPGWOT	0.145***			
MODEL 2				
DEPLOY_1			0.073**	
DEPLOY_2MORE			0.107***	
DEPLOY_1GWOT			0.168***	
DEPLOY_2MOREGWOT			0.138***	
MODEL 3				
DEPLOY_15				0.098***
DEPLOY_15MORE				0.107***
DEPLOY_15GWOT				0.153***
DEPLOY15MOREGWOT				0.141***
MODEL 4				
ONHOSTILE		0.077**		
ONNONHOS		0.122***		
HOS_NONHOS		0.099***		
ONHOSTILEGWOT		0.031		
ONNONHOSGWOT		0.167***		
BOTHGWOT		0.156***		
MODEL 5				
HOS_15			0.016	
HOS_15MORE			0.051	
NONHOS_15			0.072***	
NONHOS_15MORE			-0.036	
HOS15GWOT			0.018	
HOS15MOREGWOT			-0.115*	
NONHOS15GWOT			0.145***	
NONHOS15MOREGWOT			0.238**	
MODEL 6				
HOSTILE1				-0.017
HOSTILE1_MORE				0.043*
NHOSTILE1				0.073***
NHOSTILE1_MORE				0.058**
HOS1_GWOT				0.041
HOS1MORE_GWOT				-0.031
NHOS1_GWOT				0.145***
NHOS1MORE_GWOT				0.141***

Source: Author's estimation results of DMDC data

Table 24.   Summary of Marginal Effects of Deployment Variables

The result of the first model indicated that deployment in general had an adverse effect on retention. The magnitude of its effect was higher for the period after the start of OIF (post-GWOT period), than prior to the start of OIF. The second and third models were basically an extension of the main model with the addition of frequency and duration variables. The results suggest that whether an officer is deployed is the major factor in reducing the probability of staying and the negative effect increases substantially after GWOT. (Summary of marginal effects of all deployment variables are presented in Table 24).

In the second set of models, the main goal was to compare two types of deployments (hostile and non-hostile) and examine the difference in their effects on the treatment group (the post-GWOT cohort). Therefore, three new models with variables of hostile and non-hostile deployments were estimated to attempt to identify duration and frequency effects for both types of deployment. The results indicated that both hostile and non-hostile deployments affect the decision to leave. However, non-hostile deployments had greater effects on the decision to leave than hostile deployments. In the post-GWOT period the retention effects of non-hostile deployments were even greater compared to the pre-GWOT period. It was also seen that duration and frequency were still effective predictors of retention. Specifically, 15 months or more of non-hostile deployment for an officer had a greater effect relative to another officer with no non-hostile experience. Based on the results, an officer with more than 15 months experience in a non-hostile area is 23 percentage points more likely to leave relative to his peer in the pre-GWOT period.

It was also found that non-hostile deployments have greater adverse effects on personnel than hostile deployments. To this author's understanding, if there is a certain deployment for an officer, most will prefer to serve in a combat area rather than serving in non-hostile areas. This study believes this is mostly relevant because it affects chances of early promotion. As Fricker (2002) stated in his study, "the right type of successful deployment can enhance an individual's chances for promotion, since it distinguishes that

individual from his or her peers in a relevant manner."[25]He also mentioned that frequent peacekeeping missions that are regarded as non-hostile deployments might not give the same kind of experience as one might get from operations in Iraq and Afghanistan. On the other side, there might also be a selection issue at play: those that were sent to non-hostile regions might be deemed as less qualified and hence have higher probability to leave.

B.   RECOMMENDATIONS

The results of this study indicated that deployment negatively affects the retention behavior of Academy graduates. Comparing two kinds of deployments also show that the negative retention effect of non-hostile deployments is higher than that of hostile deployments. A decline in numbers of officers staying might lead to manning shortages in the future. This shortage might be overcome by increasing the number of accessions from other officer sources. Therefore, one recommendation for the Army is to increase the number of accessions for ROTC and OCS. Alternatively, in order to keep the same representation of Academy graduate officers in the Army population, the number of cadets may also need to be increased gradually. Thus, in the next years, the Academy would need to graduate more officers than in previous classes but keep the same proportion in the career force. A thorough cost/benefit analysis might be useful in evaluating the optimal number of new accessions before considering this option.

On the other side, the Army should take imminent actions to create new incentives for these young officers. One option is to increase the FSA and HFP allowances, thus balancing the negative aspects of deployment with additional compensation. This might create better motivation for the personnel who leave due to insufficient earnings. An alternative option is to increase the monthly payments for O-4 and above and create an incentive for these young officers to stay longer.

Decreasing the number of deployments should also be considered as a potential option. Some assignments in overseas can be reviewed and be voided with a detailed

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[25] Ronald D. Fricker. 2002. The effects of perstempo on officer retention in the U.S. military. Santa Monica, CA: RAND Org. 7.

needs assessment. Change in the number of assignments will obviously result in less frequent and shorter deployments for the current officers.

C.   FUTURE RESEARCH

In this study, the type of deployment was identified as either hostile or non-hostile by looking at the Pay File Record. FSA (Family Separation Allowance), which identifies non-hostile deployments in the pay file, were provided only for married officers in the Pay File. Therefore, non-hostile deployments for single officers were not in the dataset, thus causing a self-selection problem for the study. As more data becomes available on deployment characteristics in the future, the outcomes of similar studies may produce stronger results.

Additionally, economic factors that affect retention decisions were not discussed in this study. These factors, such as unemployment rate and civilian pay rates, are included in model specifications of other studies to strengthen the results. Therefore, in future studies, including economic indicators as other predictors of retention might provide a stronger retention prediction model.

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APPENDIX

A. FULL PROBIT RESULTS FOR MODELS WITH GENERAL DEPLOYMENT CHARACTERISTICS

	(1) General Deployment Model	(2) Deployment Frequency Model	(3) Deployment Duration Model
FEMALE	0.025	0.027	0.024
	(0.058)	(0.058)	(0.058)
BLACK	-0.243***	-0.242***	-0.243***
	(0.070)	(0.070)	(0.070)
OTHER_RACE	-0.141**	-0.142**	-0.141**
	(0.066)	(0.066)	(0.066)
HISPANIC	-0.054	-0.056	-0.054
	(0.087)	(0.087)	(0.087)
MARRIED_ WITH_ CHILDREN	-0.290***	-0.292***	-0.290***
	(0.035)	(0.036)	(0.036)
SINGLE_ WITH_ CHILDREN	-0.352***	-0.352***	-0.353***
	(0.134)	(0.134)	(0.134)
MARRIED_ NO_ CHILDREN	-0.027	-0.029	-0.027
	(0.081)	(0.081)	(0.081)
MASTER DEGREE	-1.150***	-1.152***	-1.151***
	(0.062)	(0.062)	(0.062)
COMSERV	0.091*	0.094*	0.091*
	(0.053)	(0.053)	(0.053)
COMBSUP	0.160***	0.159***	0.160***
	(0.051)	(0.051)	(0.051)
postGWOT	-0.266***	-0.267***	-0.266***
	(0.096)	(0.096)	(0.096)
DEPLOYED	0.273***		
	(0.061)		
DEPGWOT	0.397***		
	(0.103)		
DEPLOY_1		0.196***	
		(0.076)	
DEPLOY_2MORE		0.301***	
		(0.063)	
DEPLOY_1GWOT		0.438***	
		(0.127)	
DEPLOY_2MOREGWOT		0.375***	
		(0.105)	
DEPLOY_15			0.271***
			(0.062)
DEPLOY_15MORE			0.289***
			(0.102)
DEPLOY_15GWOT			0.404***

			(0.107)
DEPLOY15MOREGWOT			0.376***
			(0.133)
Constant	-0.372***	-0.372***	-0.372***
	(0.058)	(0.058)	(0.058)
Observations	6385	6385	6385
Standard errors in parentheses			
* significant at 10%; ** significant at 5%; *** significant at 1%			

B. FULL PROBIT RESULTS FOR MODELS WITH HOSTILE VERSUS NON-HOSTILE DEPLOYMENTS

	(1) General Deployment Model	(2) General Hostile Deployment Model	(3) Hostile Deployment Duration Model	(4) Hostile Deployment Frequency Model
FEMALE	0.025	0.022	0.016	0.015
	(0.058)	(0.058)	(0.058)	(0.058)
BLACK	-0.243***	-0.246***	-0.253***	-0.248***
	(0.070)	(0.070)	(0.070)	(0.070)
OTHER_RACE	-0.141**	-0.138**	-0.132**	-0.136**
	(0.066)	(0.066)	(0.066)	(0.066)
HISPANIC	-0.054	-0.054	-0.049	-0.057
	(0.087)	(0.087)	(0.087)	(0.087)
MARRIED_ WITH_ CHILDREN	-0.290***	-0.315***	-0.315***	-0.299***
	(0.035)	(0.036)	(0.037)	(0.039)
MARRIED_ NO_ CHILDREN	-0.027	-0.036	-0.025	-0.025
	(0.081)	(0.081)	(0.081)	(0.082)
SINGLE_ WITH_ CHILDREN	-0.352***	-0.380***	-0.369***	-0.359***
	(0.134)	(0.135)	(0.135)	(0.135)
MASTER DEGREE	-1.150***	-1.151***	-1.160***	-1.151***
	(0.062)	(0.062)	(0.062)	(0.062)
COMSERV	0.091*	0.089*	0.087*	0.092*
	(0.053)	(0.053)	(0.053)	(0.053)
COMBSUP	0.160***	0.159***	0.175***	0.164***
	(0.051)	(0.051)	(0.051)	(0.051)
postGWOT	-0.266***	-0.268***	-0.228***	-0.225***
	(0.096)	(0.096)	(0.080)	(0.080)
DEPLOYED	0.273***			
	(0.061)			
DEPGWOT	0.397***			
	(0.103)			
ONHOSTILE		0.206**		
		(0.087)		
ONNONHOS		0.323***		

84

		(0.077)		
HOS_NONHOS		0.278***		
		(0.065)		
ONHOSTILEGWOT		0.083		
		(0.147)		
ONNONHOSGWOT		0.434***		
		(0.128)		
BOTHGWOT		0.421***		
		(0.106)		
HOS_15			0.044	
			(0.052)	
HOS_15MORE			0.138	
			(0.186)	
NONHOS_15			0.201***	
			(0.055)	
NONHOS_15MORE			-0.102	
			(0.252)	
HOS15GWOT			0.048	
			(0.081)	
HOS15MOREGWOT			-0.341*	
			(0.203)	
NONHOS15GWOT			0.391***	
			(0.088)	
NONHOS15MOREGWOT			0.614**	
			(0.269)	
HOSTILE1				-0.047
				(0.065)
HOSTILE1_MORE				0.118*
				(0.063)
NHOSTILE1				0.199***
				(0.060)
NHOSTILE1_MORE				0.159**
				(0.068)
HOS1_GWOT				0.112
				(0.099)
HOS1MORE_GWOT				-0.087
				(0.089)
NHOS1_GWOT				0.387***
				(0.094)
NHOS1MORE_GWOT				0.374***
				(0.103)
Constant	-0.372***	-0.361***	-0.301***	-0.303***
	(0.058)	(0.058)	(0.051)	(0.052)
Observations	6385	6385	6385	6385
Standard errors in parentheses				
* significant at 10%; ** significant at 5%; *** significant at 1%				

85

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